Design Engineering

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Design Show Preview

MAY 9 1961

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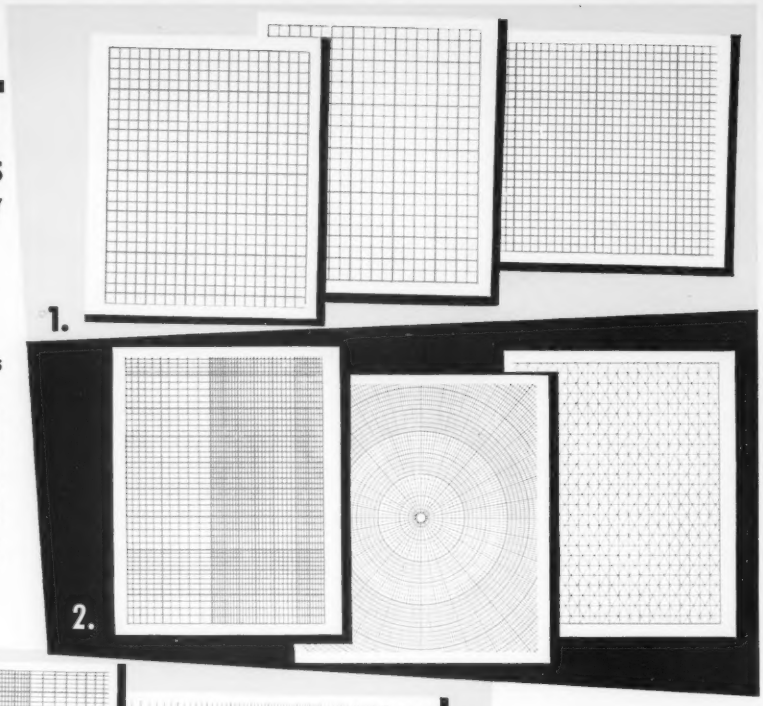

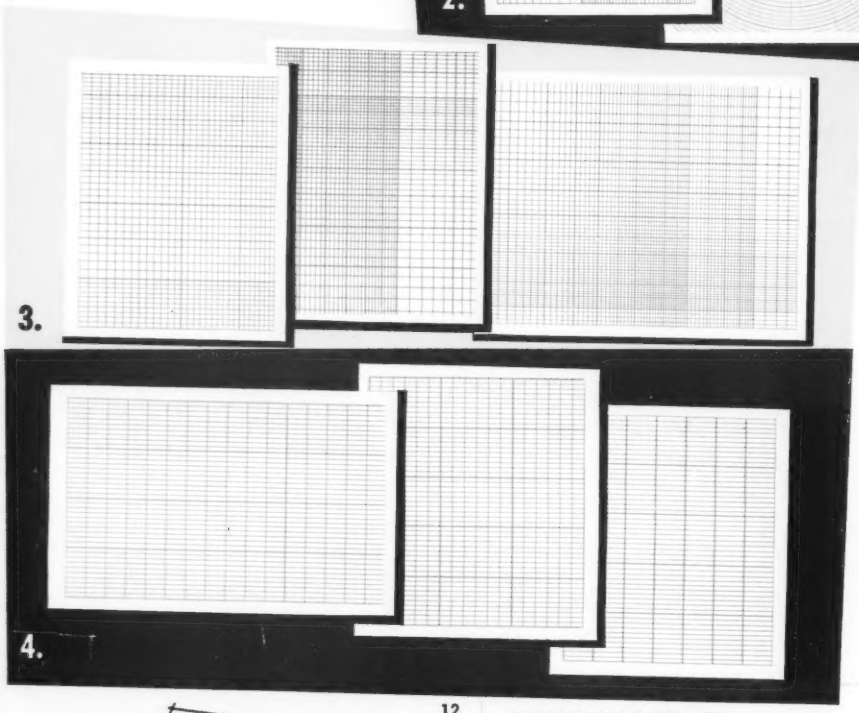

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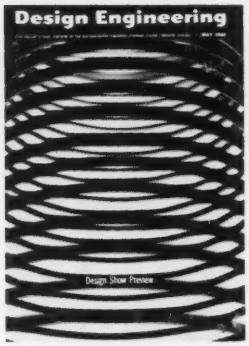

This month's cover

When we asked Ron Vickers, ARPS, for the technical details on the spring he used as the model for this month's cover, he was lost for words. "It was just a spring . . . that's all". Now turn to page 39 for some idea of the importance of material in springs. Oh yes, the model spring was courtesy of Bohne Industries Limited, of Toronto.

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61 A new service to industry

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Reader Service

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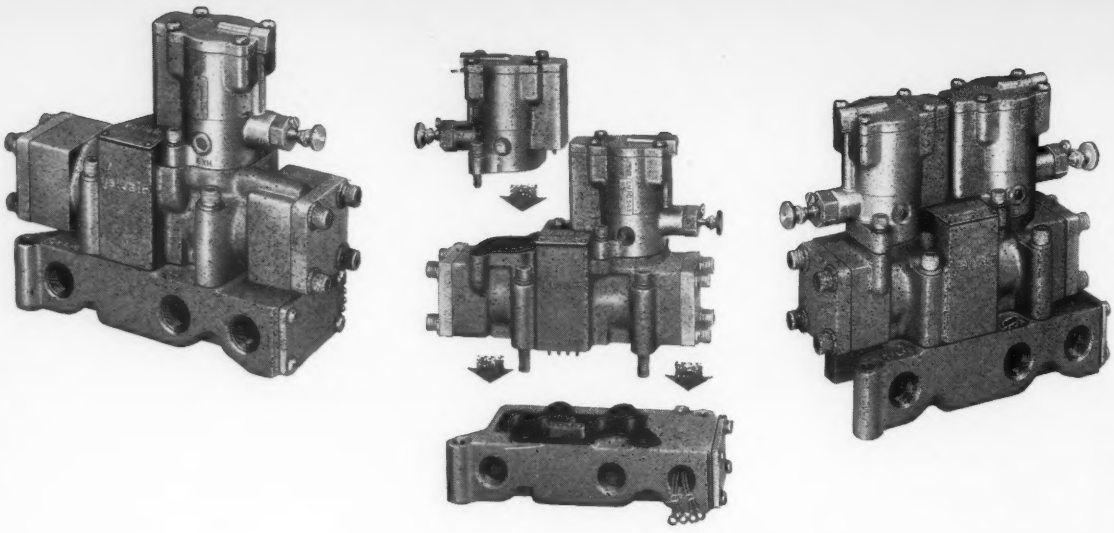

4-way single or double pilot-operated types, for sub-base or manifold mounting. Aluminum and stainless steel components assure multi-million cycle dependability. Interchangeable pilots, with coils guaranteed against burn-out for life of valve, fit any plug-in Speed King. Coils for AC or DC, most voltages . . . 35 — 200 psi range . . . integral junction box . . . optional manual over-ride, sub-base connected external pilot supply . . . ¾ in. separate exhaust ports, ½ or ¾ in. inlet and cylinder ports.

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Wanted . . . multiple-use machines

The National Research Council is considering action to encourage Canadian development of versatile machine tools capable of several uses to help cut production costs of specialized machine tools. NRC vice-president (scientific) Dr. B. G. Ballard revealed this when commenting on a suggestion for such action in the brief of the Engineering Institute of Canada to the Senate Committee on Manpower Resources.

NRC is not only giving the problem some thought, but it intends calling a meeting by late summer or fall. However Dr. Ballard pointed out that the idea of twin production tools was "still only an idea."

The Engineering Institute brief said: "We wonder if research and development in the machine tool industry to create some tools which would be highly versatile rather than highly specialized, yet suitable for mass production in reasonable quantities, might not be a fruitful pursuit. Probably the government could act as the convening agent to bring together users and builders of machine tools to identify the problem and to seek ways toward its solution."

Aerial survey plan

There's welcome news for Canada's aerial survey industry in the announcement of an $18 million federal-provincial aeromagnetic survey program to cover unsurveyed territories in the Canadian Shield and North.

Amount allocated this summer: $500,000. But over its 12-year span the program will work up to an average of $1.5 million yearly.

3½ million line miles of flying and over 6,000 separate map sheets will be required to cover the 1,800,000 square miles to be charted.

Business investment

Business investment will continue to decline according to estimates of the Trade and Commerce Department. However total capital investment for 1961 should show a slight increase over last year with social and government capital maintaining year-by-year growth.

The lower business investment program is accounted for largely by the sharp decline in the transportation industry, reflecting lower outlays by the railways and commercial airlines. This is only partially offset by a growth in the fuel and power industries, notably through new pipelines.

Iron and steel investment will be considerably lower but this is matched by planned expansion in the chemical industry. Lower wholesale and retail spending is matched by increased outlays expected for office buildings and shopping centres.

Free market survey

The Department of Trade's free surveys of markets now dominated by imported goods are becoming increasingly popular with Canadian firms, especially the major companies. Last year 800 of the country's 37,000 manufacturers made use of the service.

If you are manufacturing a product you think could fill a market now dominated by imports, check with the Department's industrial development branch. You may be entitled to a confidential report on the market for your product.

Canadian research lags

Money spent on industrial research in Canada is far behind that in comparable countries. This is borne out in the Chemical Institute's brief to the Senate Committee on Manpower Resources.

In 1958 only 0.84% of Canada's gross national product was spent on research and development. The figure was 2.48% in the U. S. and 2.09% in Great Britain.

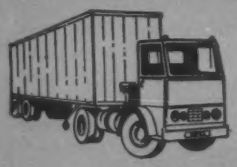
However the Canadian government's contribution of 67.9% of research finance was comparatively greater than government efforts in the other countries considered.

New product concession

Regulations have been published explaining the standards under which manufacturers may claim double depreciation for tax purposes on machinery used in producing new products. The concession applies to assets acquired after December 13, 1960 for manufacturing products of a "type not ordinarily produced in Canada."

The Department prefers to make this generalized definition of a "new product" rather than attempt it in detail. It claims common sense will be the basis for judgment.

Definitely not included for eligibility are products "occasionally or commonly subject to change, redesign or innovation" like household appliances and furnishings.



WHATEVER THE STEERING PROBLEM

BLOOD BROTHERS U-JOINTS

assure maximum safety, precision steering control

Nearly all major truck manufacturers rely on the ingenuity, ability and established leadership of Rockwell-Standard engineers to provide Blood Brothers universal joints for today's increasingly complex steering assemblies. With each new steering advancement Rockwell-Standard engineers have demonstrated their resourcefulness and skill by supplying dependable, trouble-free universal joints.

For example, the development of power steering and tilt cab trucks introduced the need for more intricate steering shaft assemblies. Rockwell-Standard engineers met the challenge with universal joints capable of transmitting power around corners without any sacrifice in operating performance or steering safety.

PARTICULARLY IMPORTANT IS THE ROCKWELL-STANDARD DEVELOPMENT OF:

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Whatever the steering assembly, whatever problems it presents, Rockwell-Standard engineers can design and develop universal joints that are reliable, efficient and economical.

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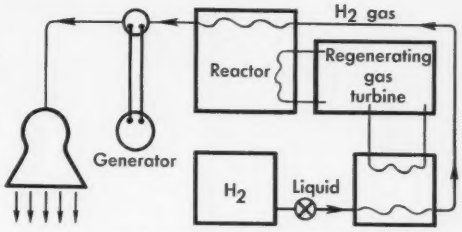
New plan may speed launching of nuclear-powered rockets

Two American university scientists have come up with an efficient plan for nuclear-powered propulsion of space vehicles . . . something that the U. S. Atomic Energy Commission and National Aeronautics and Space Administration had not thought feasible for another three to four years. The plan, developed by Professors Edwin L. Resler Jr. and Nicholas Rott, relies on superheating hydrogen in place of the present fiery-cored chemical units.



Closed cycle gas turbine works with reactor as heat source and liquid H_2 as heat sink.

To give rockets the lift necessary for them to probe the inky depths of space the main requisite is a small, efficient propulsion unit achieving tremendous power for an extended time. The two professors claim their compact system does just this, developing 750 seconds specific impulse, one and a half times that now obtained from the chemical propellants. The speed: 18,000 mph.

Using a turbine and an electrical or mechanical drive, the Resler-Rott proposal calls for use of a regenerative helium cycle with a heat sink at the temperature of liquid hydrogen. Superheating is accomplished using a compressor. *Source: Cornell University.*

Use crayons to check temperature of any hot surface

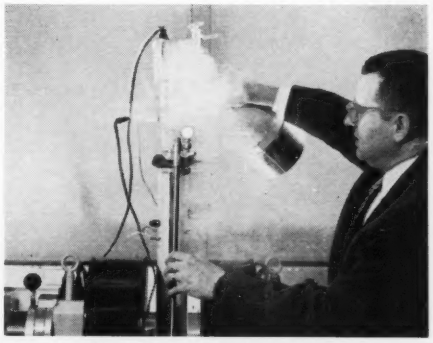
What will they think of next? Well the latest we have heard about are crayons which have the property of changing color on reaching certain specified temperatures. These changes are not just slight alterations in shade, but distinct changes to entirely different colors. We have been advised that these crayons are useful because they eliminate costly and often complicated temperature measurement methods . . . measurements can be made in areas where it is impossible to use conventional instrumentation . . . simplicity of use makes it possible for even unskilled workers to get good results.

Measurements within a range of 65 to 670C can be performed within 2 seconds. They can be used in the treatment of plastics, for controlling temperatures in dies, in annealing, during welding, and in many similar operations. *Source: Carsen Instruments Ltd.*

Circle 301 on Reader Service Card

Important discovery in magnetism should boost communications industry

Discovery has been announced of a revolutionary method for attaining extremely high magnetic fields using superconducting magnets, a development that should have important applications in communications or any field using large volumes of magnetic fields. The announcement has heralded not only a major break-through in cryogenics (low temperature research), but something that will pose questions to scientists for many years on the nature of superconductivity.

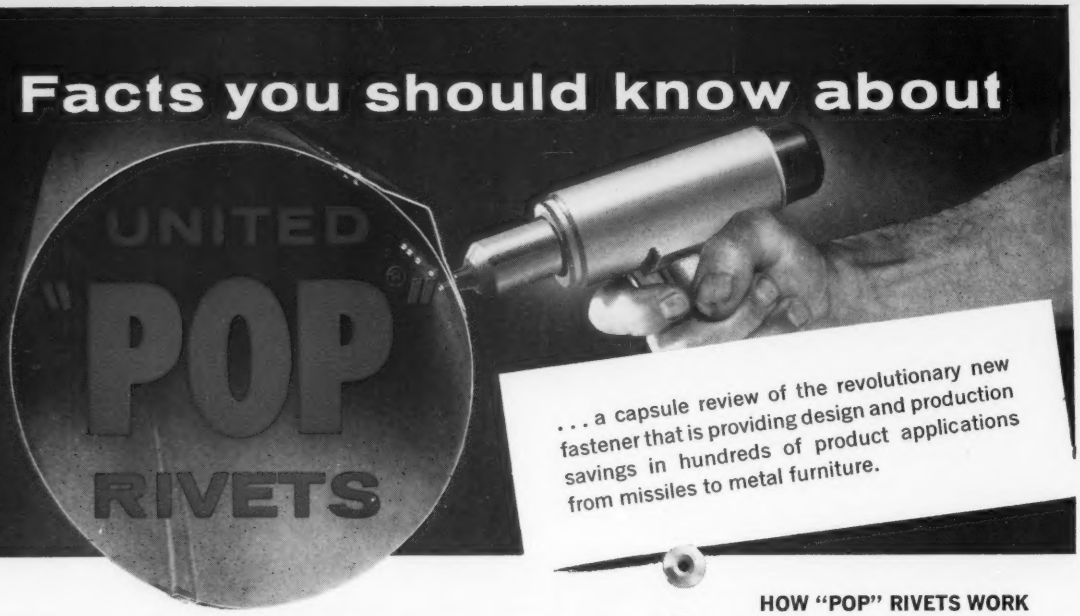


Pouring liquid nitrogen into cryostat apparatus to super-cool a compound.

American physicists have found they can produce steady-state magnetic fields of 88,000 gauss using a superconducting compound of niobium and tin made by special metallurgical techniques. It is not new that magnetic fields can be produced by superconducting solenoids, but it is new that a material can sustain fields at over a mere few thousand gauss. The new niobium-tin compound becomes superconducting at 18 degrees Kelvin, a higher transition temperature than for any superconductor presently known. And there are indications the new material will even sustain fields of 100,000 gauss while carrying electrical currents of 100,000 amps per square centimeter of cross-section.

Containment of thermo-nuclear fusion plasmas for producing electrical power and provision of high fields for use by a wider community of experimental physicists around the world are but two other applications of the discovery. To illustrate possible simplification of magnet design, a comparison should be made with some of today's conventional magnets using copper as a conductor and which require a power supply and cooling system literally filling several rooms. A superconducting magnet of the niobium-tin compound, to produce a comparable field, would not consume any electricity once the flux is established. *Source: Bell Telephone Laboratories.*

Facts you should know about



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"POP" Rivets are high strength, precision-made hollow rivets assembled on a solid mandrel. Used in "blind" and "non-blind" applications. Made in a complete range of sizes and head styles in aluminum, monel, steel and copper. Available in both "Open-End" and "Closed-End" types.

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Seal as they set. Designed to provide a pressure and vapor tight seal. Ideal for tanks, vessels, or applications where weather tightness is required. Available with domed or countersunk heads in a wide range of sizes and grip lengths.

OPEN-END "POP" RIVETS

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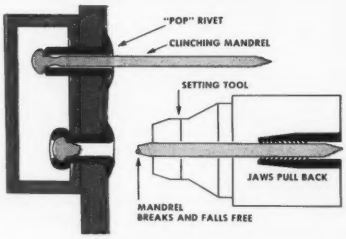
HOW "POP" RIVETS WORK



"POP" Rivets are inserted and set from the same side of the work. The retracting jaws in the setting tool pull the mandrel head into the rivet on the reverse side until the mandrel breaks under tension. This high clinch action pulls parts together exerting up to 600 lbs. squeeze and produces a tight, positive, vibration-proof fastening over a wide range of stock variations.

ONLY $19.95 prepaid

Let This Kit Introduce You To "POP" Rivets

Discover this new way to simplify design, improve quality and speed production. Introductory kit contains approximately 240 "POP" Rivets in various lengths and materials together with a hand setting tool. Complete with instructions and application hints. "POP" Rivets can save as much as 50% on installed costs!

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UNITED "POP" RIVETS

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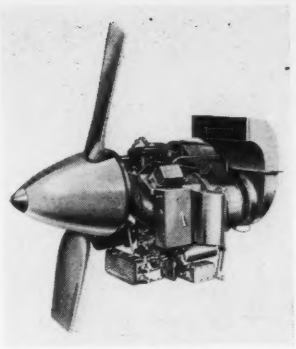
A small, compact turbo-prop engine for light aircraft

Canada, country that relies to a large extent on light aircraft for traversing her rugged northlands, will welcome the successful trials of a light-aircraft powered by the world's smallest and most compact turbo-prop engine. Amazed onlookers recently saw the engine used in a Currie Wot bi-plane in a demonstration flight near Birmingham, England.

Weighing only 235 lb., including propeller and standard accessories, the motor develops 70 hp for take-off and 60 hp for maximum cruising. It is electrically started and cruises at 46,000 rpm. It is only 20 inches wide, 27½ inches high and 49 inches long (including propeller). Another higher powered model (not yet demonstrated) has the same weight and dimensions but develops 90 hp for cruising and an extra 30 hp for take-off.

Fueled by any light liquid distillate, including kerosene or diesel fuel, these single-shaft bantam turbo-props were designed to meet present and future needs of the aircraft club and busy executive. But they can be fitted to existing light aircraft without large airframe modification: *Source: Rover Motor Co. of North America Ltd.*



The 70hp turbo-prop

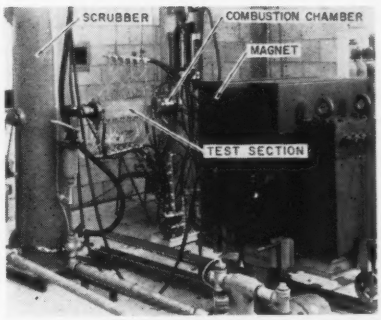
Circle 302 on Reader Service Card

Experiments to develop a power generator with no moving parts

A power generator with no moving parts. That's the feature of a new experimental model for the direct conversion of heat to electricity.

Detailed progress of a year's research into the new generator were presented to a recent symposium in the U. S., where it was revealed that scientists were collecting technical data which may soon enable commercial application of power generation using the simple magnetohydrodynamic principles. When a magnetic field is applied transversely across a conducting field a voltage is induced in the field at right angles to both the magnetic field and the direction of fluid flow. The induced voltage will cause an electrical current to flow through an external load thereby delivering electrical power.

The experimental generator, at Newport Beach, California, has a water cooled chamber for producing ionized gases, a magnet and a power generation section in which electrodes collect the electrical currents generated in the hot gas and auxiliary equipment.



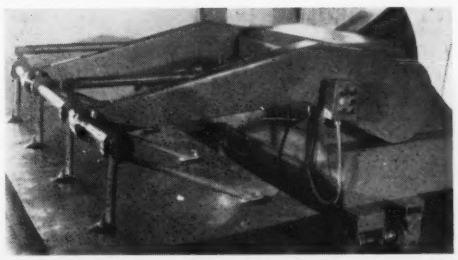
The injection system where chemical reagents are metered into the stream.

The major problems to be overcome before efficient generators can be built are in areas of high temperature materials suitable for operation in combustion product atmosphere at temperatures of 5,000 degrees or for extended periods of time. *Source: MHD Research Inc.*

Another Canadian first: an automated laminating press

Large manufacturers of plastic laminates in Canada and the United States are now using a new automated laminating press developed in Canada. And as they use the new machine to help slash production costs, work is pressing ahead to fill orders from Europe.

Up till now one of the biggest problems in laminating has been the time wastage (sometimes up to 30% of production time) in feeding and removing materials, especially with the larger presses. This is where the Canadian designers stepped in. They developed an automatic loading and unloading system that cuts idle time from what is often thirty minutes to about thirty seconds. Control can be effected by one man working from a remote control room where he may operate up to five 15-platen presses at once.



Caul-turning machine, with vacuum cups, disassembling books of finished laminate sheets.

The main features of the new system are a self-contained, hydraulic, remote control caul-turning machine; a multiple layer cage arrangement for loading; an unloading unit with a pulling device to remove cured books; and a transfer conveyor which automatically returns the cured books to the loading end for disassembly. *Source: Pathex (Canada) Ltd.*

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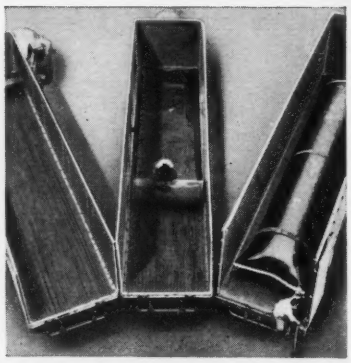
WHEN AND WHERE TO USE

NEOPRENE

Made by Du Pont for 28 years, this synthetic rubber has demonstrated that it can be used with excellent results in a wide variety of applications. It meets many different service requirements and environmental conditions. Neoprene offers a balanced combination of properties not available in any other single elastomer. Neoprene not only offers desirable elastomeric qualities, but also offers good all-around resistance to many deteriorating influences. Because of these properties in combination, neoprene is being used in an ever-growing number of new applications.

COMPRESSION SET

Neoprene sealing gaskets now solve the problems of air and water leakage through curtain-wall panel joints. Neoprene is weatherproof and trouble-free, applies sustained sealing pressure because of its low permanent compression set. Gaskets simply snap over panels, save installation time.

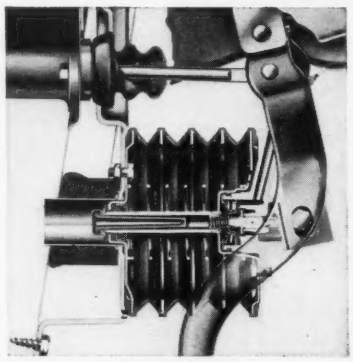


WEATHER RESISTANCE

Portable containers that hold large volumes of liquid, yet roll up into compact bundles, are now made practical by an outer covering of neoprene. Neoprene resists sunlight, weathering, ozone, oils and chemicals. In addition, it takes severe flexing without cracking.

OZONE RESISTANCE

Tire sidewalls made with neoprene have now solved the problem of ozone cracking on the West Coast. Before neoprene, tires with only 30% tread wear often developed severe sidewall cracks. Now neoprene keeps sidewalls crack-free and new-looking for the life of the tire.



FLEX FATIGUE

A neoprene bellows offers excellent resistance to flex-cracking in an automotive power brake unit. The bellows withstands 500,000 flexing cycles in standard tests. Neoprene also resists oils, temperature extremes, and provides good sealing by reason of its low permanent compression set.

HOW DUPONT ELASTOMERS COMPARE IN IMPORTANT PROPERTIES

RATING	PROPERTIES											
	RESILIENCE	RESISTANCE TO OXIDIZING CHEMICALS	HEAT RESISTANCE	OIL RESISTANCE	LOW TEMPERATURE PERFORMANCE	COMPRESSION SET	FLEX FATIGUE RESISTANCE	WEATHER AND SUN RESISTANCE	OZONE RESISTANCE	ABRASION RESISTANCE	ELECTRICAL	FLAME RESISTANCE
Excellent	■	□	■	■	□	■	■	■	■	■	□	■
Good	■	■	■	□	■	□	□	□	□	□	■	□
Fair	□	□	□	□	□	□	□	□	□	□	□	□

■ Neoprene □ HYPALON

DU PONT ELASTOMERS

HYPALON*

A relatively new Du Pont elastomer, HYPALON has quickly won ready acceptance in heavy-duty as well as decorative applications. This synthetic rubber gives the designer a material that is ozone-proof and also highly resistant to sunlight, weather, oxidizing chemicals, abrasion and heat. HYPALON has an added advantage in that it can be compounded in unlimited colors—colors that are unusually stable to light and weather. For greater economy, HYPALON can often be compounded with other elastomers or applied as coatings over other materials.

Send the coupon today for technical assistance and publications describing Du Pont elastomers in detail.

ABRASION RESISTANCE

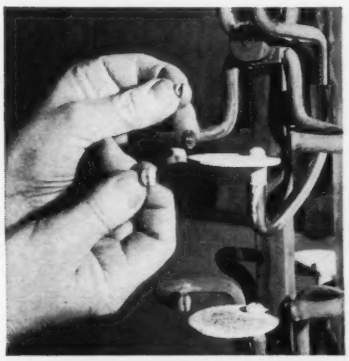
On a conveyor belt for 275-324° F. salt, a covering of ordinary heat-resistant rubber used to crack badly after only 3 months' service. A belt with a ¼" cover of HYPALON, however, was in good condition after 6 months' service.

HEAT RESISTANCE

HYPALON jacketing now permits ignition wire to withstand higher engine temperatures. This jacketing meets a heat aging requirement of 5 days at 275° F. plus peak temperatures above 300° F. HYPALON also prevents ozone cracking, resists corona cutting, abrasion, oils and chemicals.

COLOR STABILITY

In a new gunwale guard, two HYPALON strips available in a variety of colors permit contrasting color combinations to match any boat. Because of HYPALON, the gunwale guard resists abrasion, oil, salt water and features unusual color stability to sunlight and weather.



CHEMICAL RESISTANCE

Now that metal plating racks are protected by HYPALON, the coatings last more than 12 times longer than plastic coatings. HYPALON offers exceptional resistance to plating solutions, withstands high temperatures without hardening, and resists abrasion during plating operations.

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ADIPRENE*

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INTRODUCING

THERMOCHROM

Chromatic Thermometer Crayons

These are temperature indicating materials which have the property to change their original color when certain temperatures are reached. These changes are not merely slight alterations in the shade of the original color, but a distinct change to a completely different color.

WIDE TEMPERATURE COVERAGE

Eighteen THERMOCHROM CRAYONS provide temperature measurements from 150°F to 1240°F. One crayon enables several hundred temperatures to be measured — according to the length of stroke and the temperature — so that the average cost per measurement is negligible.

WIDE APPLICATION

Every shop and laboratory can use **THERMOCHROMS** to improve product quality and reduce production costs. Recommended ranges for specific industries are:

THERMOCHROM 150-390°F.—For the paper, rubber, textile, plastics, chemical, and electrical engineering industries; also for the control of steam boilers and motors.

THERMOCHROM 390-840°F.—For zinc foundries and the aluminum and glass industries.

THERMOCHROM 840-1240°F.—For the iron and steel industry, welding, foundrywork and enamelling.

THERMOCHROM is available as follows:

2814 case	Plastic case containing 6 crayons. Press button, hinged interior. Sample kit, or Supervisor's Pack.	1 each crayon 165, 210, 250, 300, 350, and 390° F.
2817 case	Working Pack, with 12 crayons.	Assorted as desired.
2820 case	Working Pack with 18 crayons and 1 aluminum clamp holder.	Complete range of crayons (1 of each).

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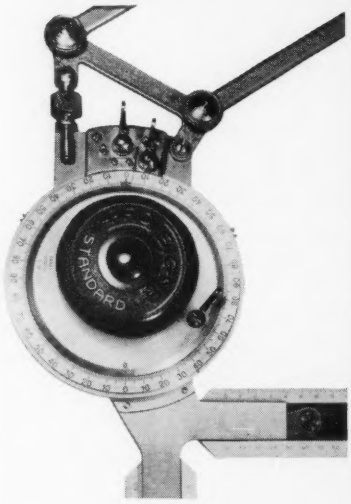


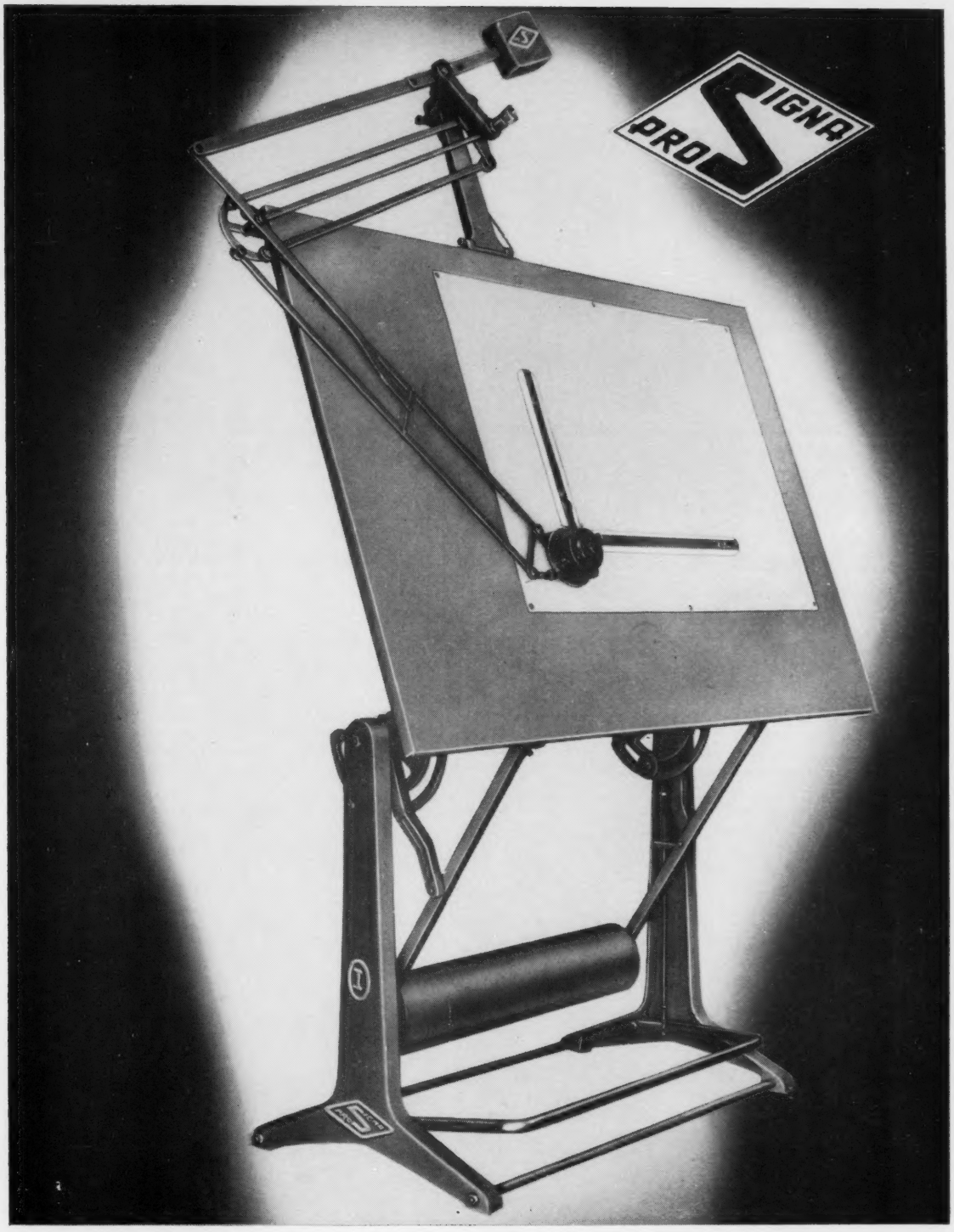
Two interchangeable protractor head models are available:

Model K — Standard full-view 360° head with ball bearing indexing and micrometer adjustment.

Model KB — Same as above, but with automatic zero-reset for use in drawings with several axis systems.

See your **ALPHA-FABER-CASTELL** dealer, or contact **CARSEN INSTRUMENTS LTD.** for further information.

INTRODUCING



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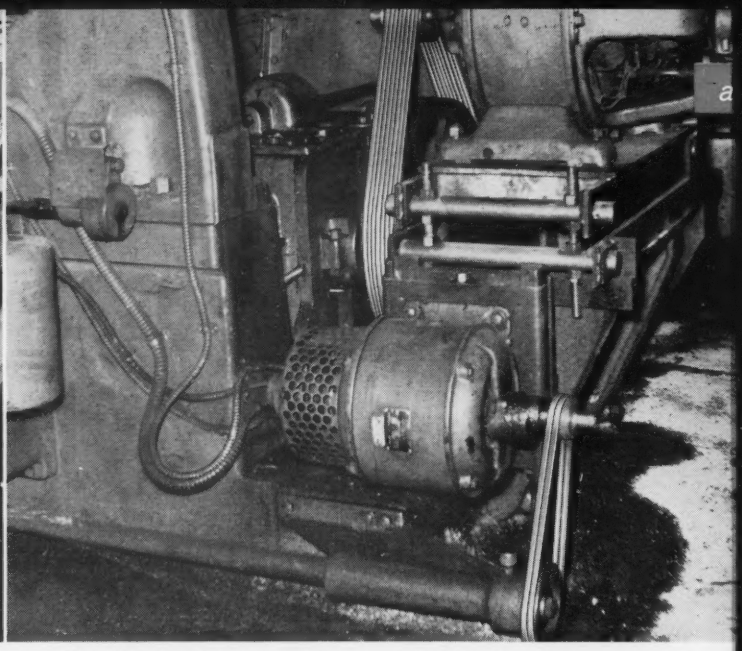
Gates Industrial News



Gear drive caused chatter marks on parts

Gates High Capacity Drives replace gear and flat belt drives

GATES SUPER HC DRIVE REPLACES GEAR DRIVE IN LIMITED SPACE...

ends costly rejects

Chatter marks on parts produced by a vertical boring mill at Manitoba Bridge and Engineering Works, Ltd., in Winnipeg resulted in costly rejects. The cause of the chatter marks was traced to the gear and pinion on the main drive.

About a year ago, the plant engineer investigated the possibility of replacing the gear drive with a flat belt or conventional V-belt drive. However, to do the job, both types of drive had to be too large to fit into the limited space available.

Advised by a Gates Representative, he then designed a Gates Super HC High Capacity Drive for the boring mill. He found that the high capacity Gates Drive was so compact that it could readily transmit the required power in the space vacated by the gears. Now, with the smooth-running Gates Drive, the mill is turning out clean, even cuts, eliminating chatter marks.

The Gates Fieldman located near you is a drive design expert. To contact him for help in designing a new drive, or for quick delivery of replacement V-belts, call your nearby Gates Distributor.

World's largest maker of V-Belts

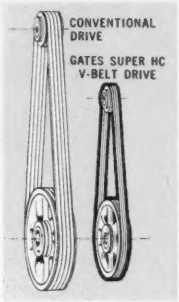
Gates

Gates Rubber of Canada Ltd.

Brantford, Ontario X973E

Designing a new Drive?

Gates High Capacity Drive saves space and money ... cuts bearing loads



When you design a new drive or replacement drive, you can save space, weight and money by using a Gates Super HC V-Belt Drive—the first and most advanced high capacity drive. Because of exclusive design features, this new Gates Drive can often transmit the required horsepower in about half the space needed by a conventional V-belt drive—with fewer belts and smaller sheaves.

Drive costs are reduced as much as 20%. Drive weight is reduced 20% and more. Guards and machine housings can be smaller, shafts shorter. Reduced weight and overhang on bearings cut bearing loads. Moreover, the Gates Super HC Drive can operate at belt speeds up to 6,000 ft/min without dynamic balancing!

Need replacement V-belts?

Why Gates Hi-Power V-Belts are industry's No. 1 choice today

The exclusive construction features of Gates Hi-Power V-Belts—Concave Sides, Precisely-Engineered Arched Top, Flex-Bonded Tensile Member—make them more dependable than ordinary conventional V-belts, giving you far longer belt life on even the toughest applications.

Moreover, because of Gates high standards of quality control, you get a perfectly matched set of Hi-Power V-Belts every time—every belt pulls its share of the load throughout the long service of the drive, further increasing belt life.

For further information mark No. 125 on Readers' Service Card

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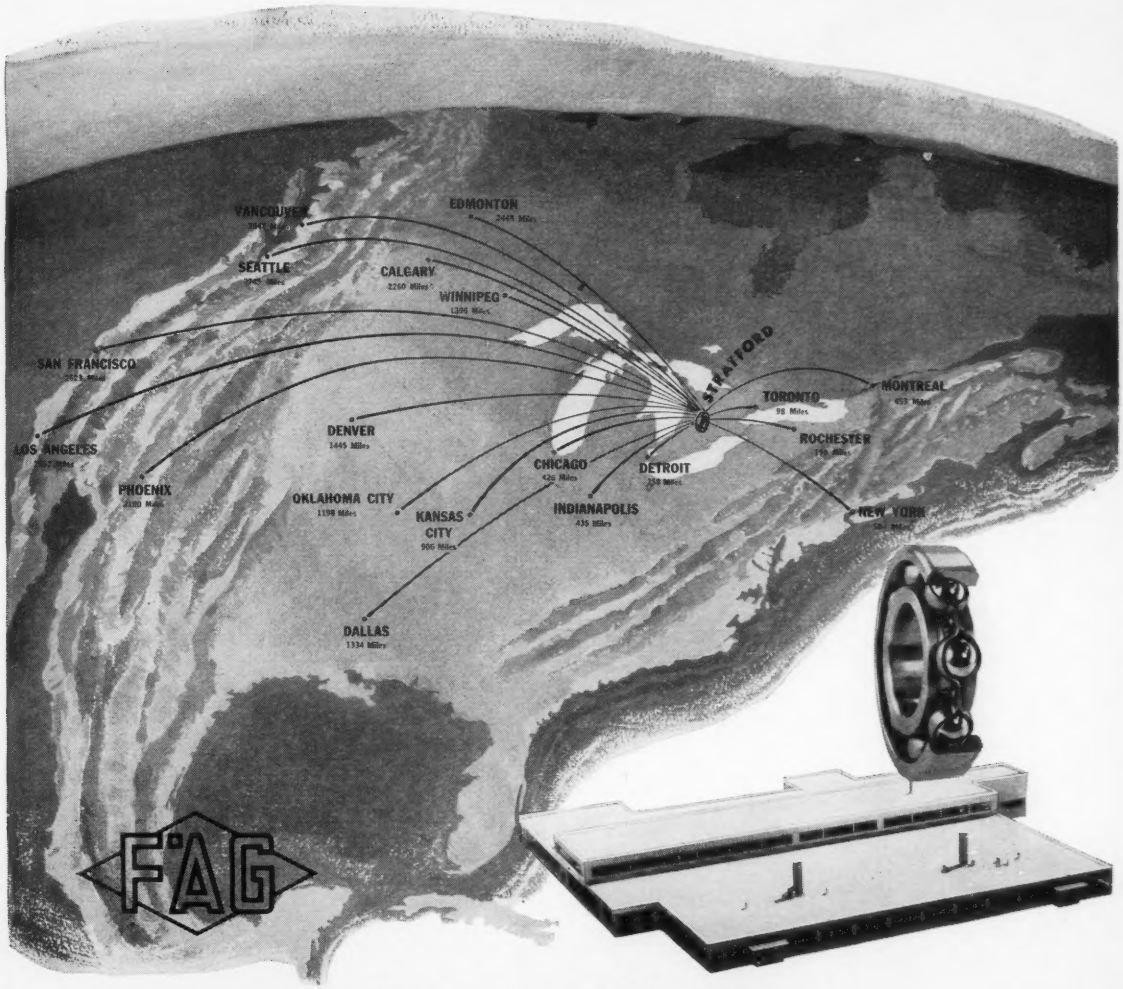
...TO THE NORTH AMERICAN MARKET

Proud offspring of the world founder of the ball bearing industry, Fischer Bearings Manufacturing Limited of Stratford, Ontario, is strategically located to service precision bearing requirements in the U.S.A. and Canada.



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Blueprint, xerography, diazo, photography. No matter what process is used to reproduce your drawings, if they're Venus made, you'll get crisper, clearer prints. And because Venus leads are densely packed with the world's finest ground graphite, only very light pressure is required to apply a clean, opaque line on any material you use. Saves you time and effort. Venus drawing pencils come in 17 degrees of hardness. Draftsmen's leads and holders are also available.

Send for free samples in your favourite degrees of hardness.

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DEMONSTRATES ITSELF

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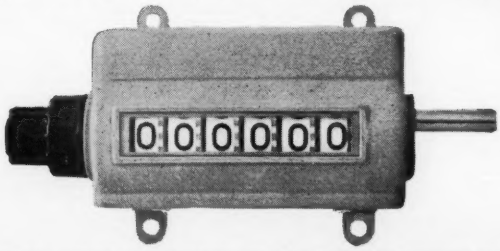
Now numbers big enough to see at 20 feet . . . on the Veeder-Root Visicounter! No squinting, no stretching with the new Visicounter. This counter, with larger than ordinary figures, provides easy read-out for difficult-to-see locations. And, no matter how hard your machinery jiggles or punches, the Visicounter goes right on scoring because it's built to take it. Whether designing new machines or boosting efficiency of present equipment, you'll find that it pays to check into Viscounter. Write: Mechanical Mgr., Veeder-Root of Canada, Ltd., P. O. Box 156, Toronto 18. **count on...Veeder-Root**



Visicounter is available in ratchet types, with speeds up to 500 counts per minute, or in geared types with up to 1,000 counts per minute. The new figures, larger and sharper, are another example of Veeder-Root design for maximum efficiency.

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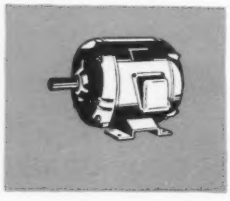
WHERE *Quietness* COUNTS

install Wagner

SLEEVE BEARING *resilient* MOUNTED MOTORS

The silent-running sleeve bearings plus the special Wagner resilient mounting make these motors exceptionally quiet. Particularly suited for circulating pumps on heating systems, air conditioning pumps and blowers in hospitals, clinics, executive offices, etc.

Wagner resilient mounted motors are available in 1 to 5 H.P. as well as fractional horsepower sizes.



The newly designed Wagner Motors are smaller in size—more rugged. Resist distortion due to handling and mounting. Built to C.E.M.A. standard mounting dimensions. For a quieter, longer, happier life turn your motor problems over to Wagner!

Wagner Motors are designed, engineered and manufactured in Canada

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116 reasons why we can help you put your finger on the right plastic faster

85 PHENOLITE® laminates...

3 thermoplastics—nylon, DELRIN,* PENTON†

16 grades of Vulcanized Fibre...

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This will give you an idea of how surely NATIONAL can help you pinpoint exactly the plastic you want. NATIONAL has the broadest line in the industry, including standard forms, precision-fabricated parts, and a huge stock of many grades ready for immediate shipment. For fast help, samples, or more information, contact your nearby NATIONAL sales office, listed at right. It's a direct line to the one best material per dollar of design performance.

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* DELRIN IS A DU PONT TRADEMARK FOR THEIR ACETAL RESIN. • † PENTON IS A HERCULES TRADEMARK FOR THEIR CHLORINATED POLYETHER RESIN. • PRINTED IN U.S.A.

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STRENLITE*

STELCOLOY—*High-Tensile Low Alloy!*

- High strength-to-weight ratio.
- High impact properties at low service temperatures.
- Twice the atmospheric corrosion resistance of copper-bearing steel.
- Four to six times the resistance of mild steel to atmospheric corrosion.
- Can be readily cold formed.
- Good welding properties.
- Provides excellent adherence for paint.

STRENLITE—*Strong Yet Light!*

- Saves weight without sacrificing strength.
- Equals copper-bearing steel in corrosion resistance.
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- Suited to bolted or riveted assemblies.
- Can be successfully welded with mild steel electrodes.
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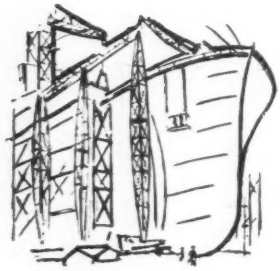

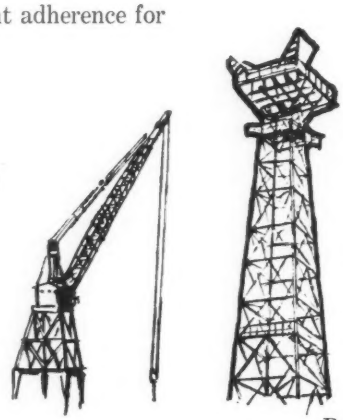

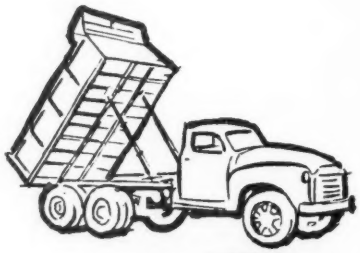

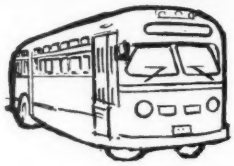

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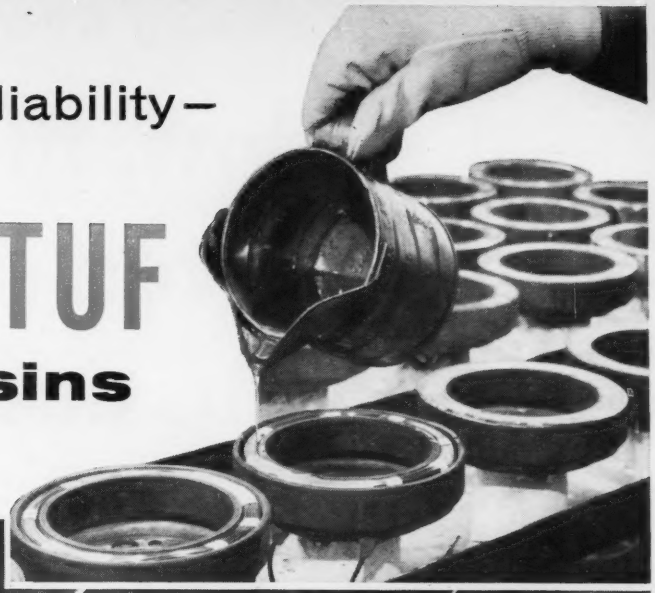
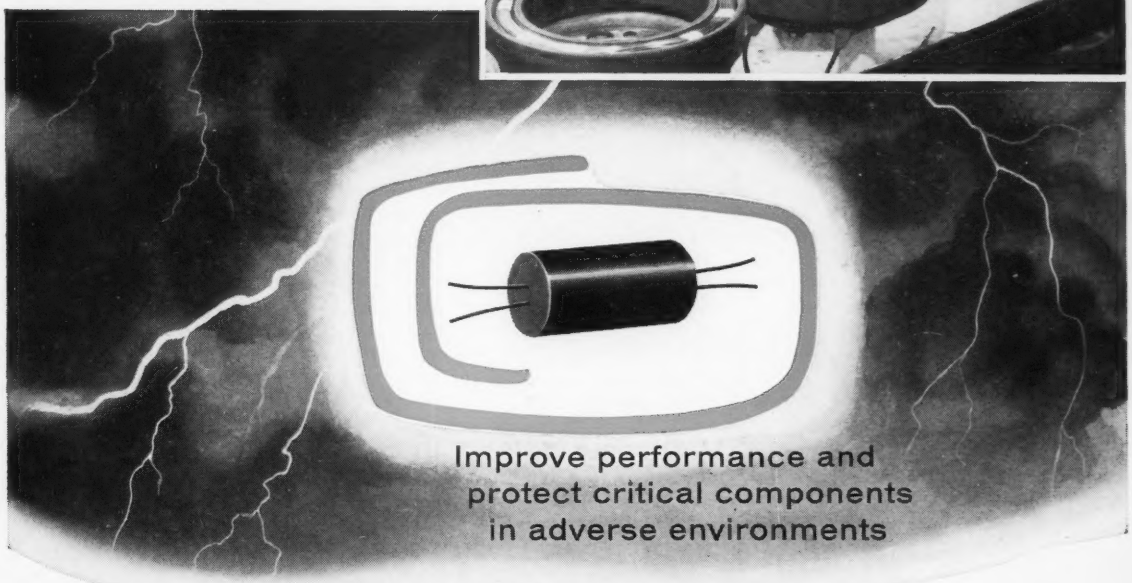
Epoxy Resins





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Capacitors, coils, and electronic "building blocks"... Miniature transformers, and transmission line transformers . . . Printed circuits, relays, terminal boards and other electrical and electronic assemblies can be made to perform with higher reliability when they are impregnated, potted, or encapsulated with epoxy. And when the materials used are based on RCI EPOTUF epoxies, you are using the epoxies produced by the most modern process to achieve continuous product uniformity and high quality. In fact, the low residual hydrolyzable chlorine in RCI EPOTUF epoxies also makes it possible to achieve higher electrical properties.

For information on epoxy resin formulators who use EPOTUF epoxy resins and hardeners, or for data on pure EPOTUF resins and special curing agents, get in touch with RCI.

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Now, more than ever, it's time to cut costs!

Speed Nut Fasteners give savings of 30% to 75% or more over other methods

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Our skilled engineers will take one of your finished units, carefully disassemble it, study it piece by piece and reassemble it using Speed Nuts where applicable. Then, in a detailed report, we will provide an accurate accounting of the time and cost savings realized.

There are over 8,000 different types and sizes of Speed Nuts now in production. If, however, there is not a Speed Nut that is entirely suitable for your particular application, our creative engineers will develop one that is.

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Design Notes on Fluid Power

RELEASE No. 9—"How to get clean, dry instrument air"

More and more processes are being controlled automatically by pneumatic instruments. Generally, a sensing device translates its reading into a pneumatic pressure between 3 and 15 psi; this pressure, when directed to the controlling instrument, causes the control to modulate in proportion to the pneumatic pressure.

Pneumatic instruments are reliable and stable, provided the operating air is free of moisture, oil and dirt. This can now be achieved by using a battery of contaminant separators in the main line.

A high-quality water separator, (not all "airline filters" are effective water separators), with an automatic float-operated drain, will remove over 99% of the water droplets; however, no filter-type water separator can remove any of the "gaseous moisture", or water vapor, in the air. The air coming out of the water separator will generally be at 100% relative humidity, and any lowering of its temperature will cause additional droplets to condense out.

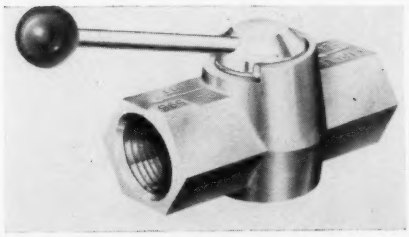
It is now possible to remove the water vapor simply and cheaply by using a desiccant type dehydrator. The unit, illustrated below, can lower the dewpoint to —45°F when the temperature of incoming air does not exceed 90°F. This means, of course, that no further moisture will condense out of the air unless it were cooled below —45°F, a most unlikely occurrence.

The water separator, which is installed first in the line, lengthens the life of the dehydrator by removing most of the moisture in droplet form. The next unit in the battery is an oil-removing filter, which sponges the oil droplets out of the air; oil fumes in your instrument air will, over a period of time, cause the orifice to plug up. Then, the dehydrator lowers the dewpoint, and your instrument air is ready, clean, dry, and free of oil, to operate your pneumatic instruments.

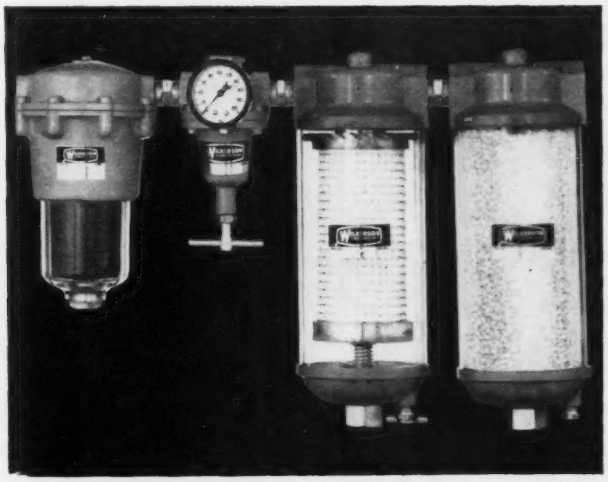
The desiccant can, if desired, be reactivated. But, due to the low price of a new replacement charge, most operators will find it more economical to replace the desiccant. The exact amount needed for a charge is packaged in air-tight containers, for easy replacement.

The dehydrator has a transparent shell of acrylic plastic tubing, which allows the user to inspect visually the condition of the desiccant at all times, and determine when a change is needed. A color label on the unit can be compared with the color of the desiccant: when the desiccant is the same shade as the label, it is time for a change.

A second desiccant is available for the extreme removal of oil from gases, down to 24 parts per million by weight. A third type is available where it is desired to lower the dewpoint to —100°F.



Speaking of instrument air, you'll be interested in Circle Seal's 9200 series plug valve. Rated at 150 psi, it seals absolutely dead-tight against both internal and external leakage; provides effortless opening and closing without ever jamming. O-ring seals virtually eliminate wear. Service without removing from the line: just replace three O-rings; no stem-packing adjustment required.



This illustration shows a typical instrument air set-up. The air comes in from the left, first through a water-separator type filter which removes the solid contaminants as well as the water droplets. The air regulator reduces the pressure to the desired working pressure. The next unit is the Whirl-flo which removes oil droplets. Finally, the Wilkerson Chem-Guard dehydrator lowers the dewpoint. Write for additional information.

WILKERSON

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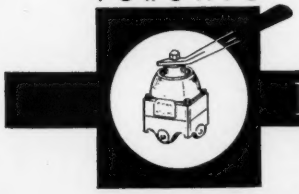

ROUSSEAU CONTROLS LTD.

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2149 Yonge Street, Toronto 7, Ont.

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ZYTEL NYLON

MADE BY DU PONT IN CANADA FROM CANADIAN MATERIALS

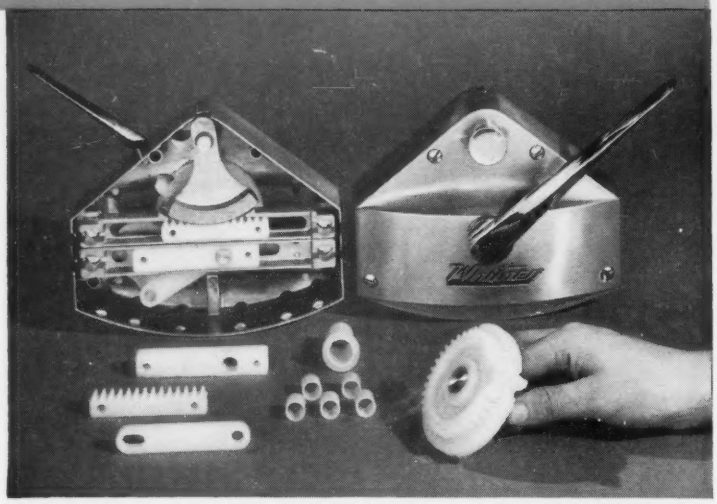
helps create a new Canadian design

By redesign of conventional metal components to use "ZYTEL", the designer of this new boat control reduced the unit's weight to only nine pounds, eliminated corrosion of working parts as well as lubrication, and lowered the unit's cost considerably below that of similar equipment.

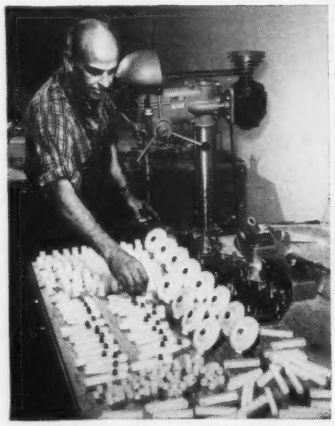
A test conducted by Canadian Applied Research Limited, Toronto, showed that after 200,000 operating cycles under full load, the "Whitney Automatic" revealed no defects, deterioration, or appreciable wear of ZYTEL* or other parts. *In fact, the only noticeable change at conclusion of the test was increased smoothness of operation — yet this test was equivalent to 100 years of normal boating!*

Injection moulding enables the design of fewer parts to do the same job and eliminates assembly operations. Moreover, the use of "ZYTEL" nylon's low friction characteristics, heat resistance, and lack of corrosion permits an unconditional guarantee of the "Whitney Automatic". *When asked why he decided to use "ZYTEL" in developing the unit, Mr. Buddo stated that he found "ZYTEL" the ideal answer to his problem of economy as well as mechanical efficiency.*

For further information write to Du Pont of Canada Limited, Plastics Division, P.O. Box 660, Room A-4, Montreal, Quebec.



Front and back views of the new "Whitney Automatic". Its "ZYTEL" nylon components include a 3¾-inch gear rack, a throttle bar and drag link, a 3¾-inch main drive gear, 5½-inch bushings and a ¾-inch bushing moulded with a flange.



Assembly is simple. The 10 nylon parts, moulded by Midland Plastics, Midland, Ontario, from "ZYTEL" produced at Du Pont of Canada's Kingston, Ont., plant, make possible precision-engineering with no metal-to-metal contact.

Inventor C. W. Buddo (Left), president of Lake Controls Limited, Toronto, and Lake Controls Inc., Buffalo, discusses his single-lever outboard motor steering wheel control with John McDiarmid, chief engineer. The most recent innovation of the "Whitney Automatic" is to replace a brass pin on the throttle bar with nylon so that this unit is now moulded as a single piece, further streamlining production.

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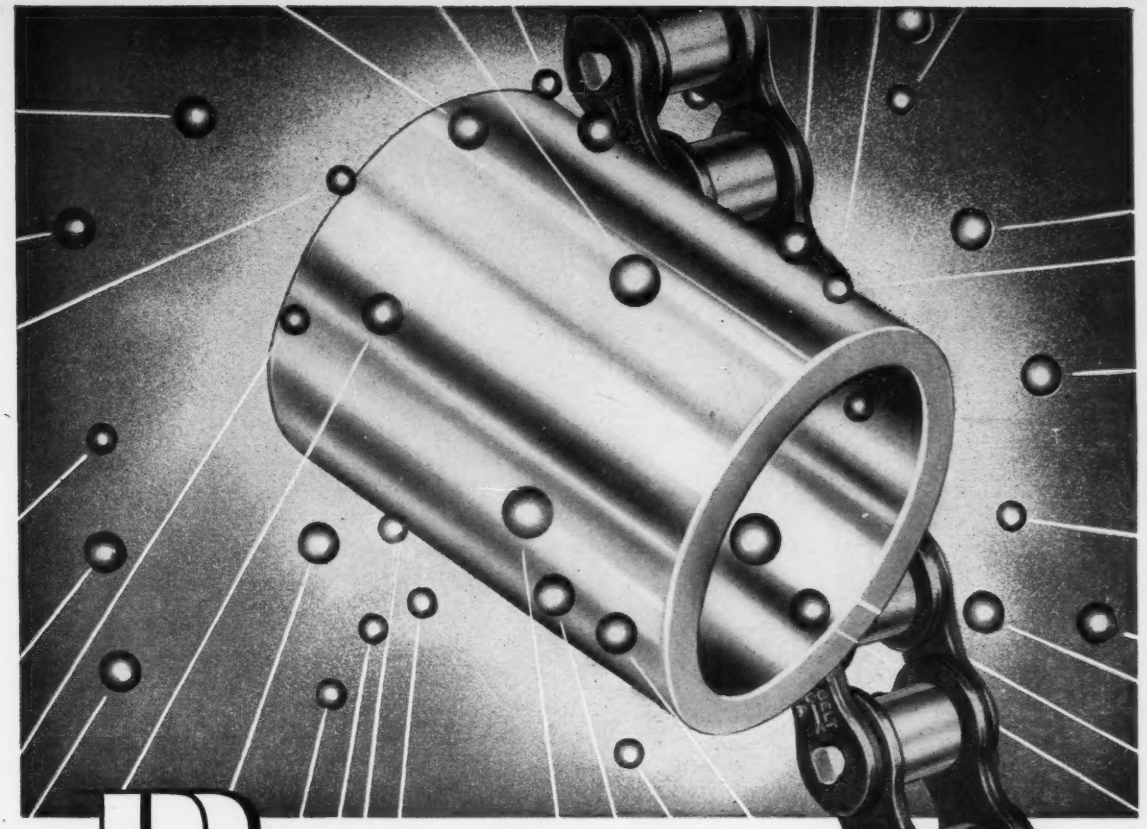

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Shot-peening "cold-works" extra fatigue life into LINK-BELT roller chain

Shot-peening gives rollers of Link-Belt precision steel roller chain exceptional strength and stamina. And after shot-peening, they are burnished rather than ground or sanded. This achieves a SILVER-BRITE finish—and more important, *retains the fatigue resistant qualities of shot-peening.*

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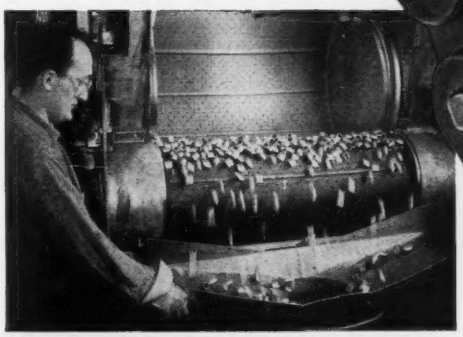

LONG LIFE AHEAD! Rollers for Link-Belt precision steel roller chain tumble out of shot-peening machine after being cold-worked to withstand punishment of today's high-speeds and heavy loads.

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BOOK 2657 has 154 pages of roller chain data. For your copy, contact your nearest Link-Belt office or authorized stock-carrying distributor. (See CHAINS in the yellow pages of your phone book.)

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60273-B

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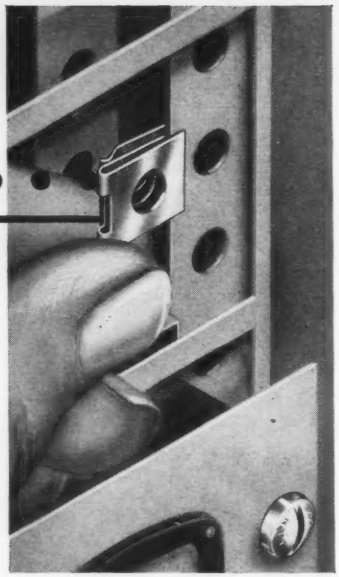

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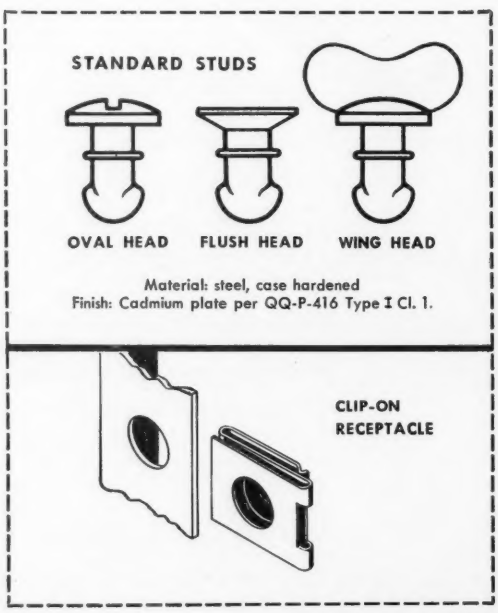

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Versatile VIBRATHANE 402 is also finding major uses as insulation (in refrigerators and freezers, for examples) and as packaging ... particularly where its inherent structural strength results in important design economies.

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(Characteristics "V" and "G")

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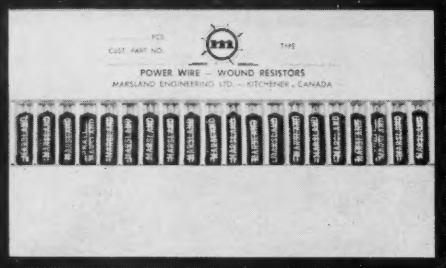
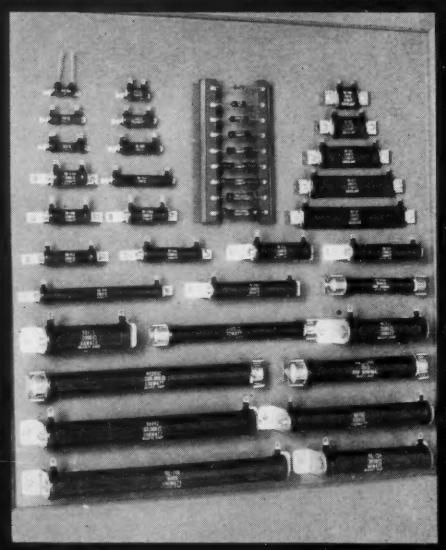
Marsland Vitreous Enamelled and Silicon Coated Power Wire Wound Resistors are a completely Canadian product. For additional information or detailed specifications contact:-





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M/4

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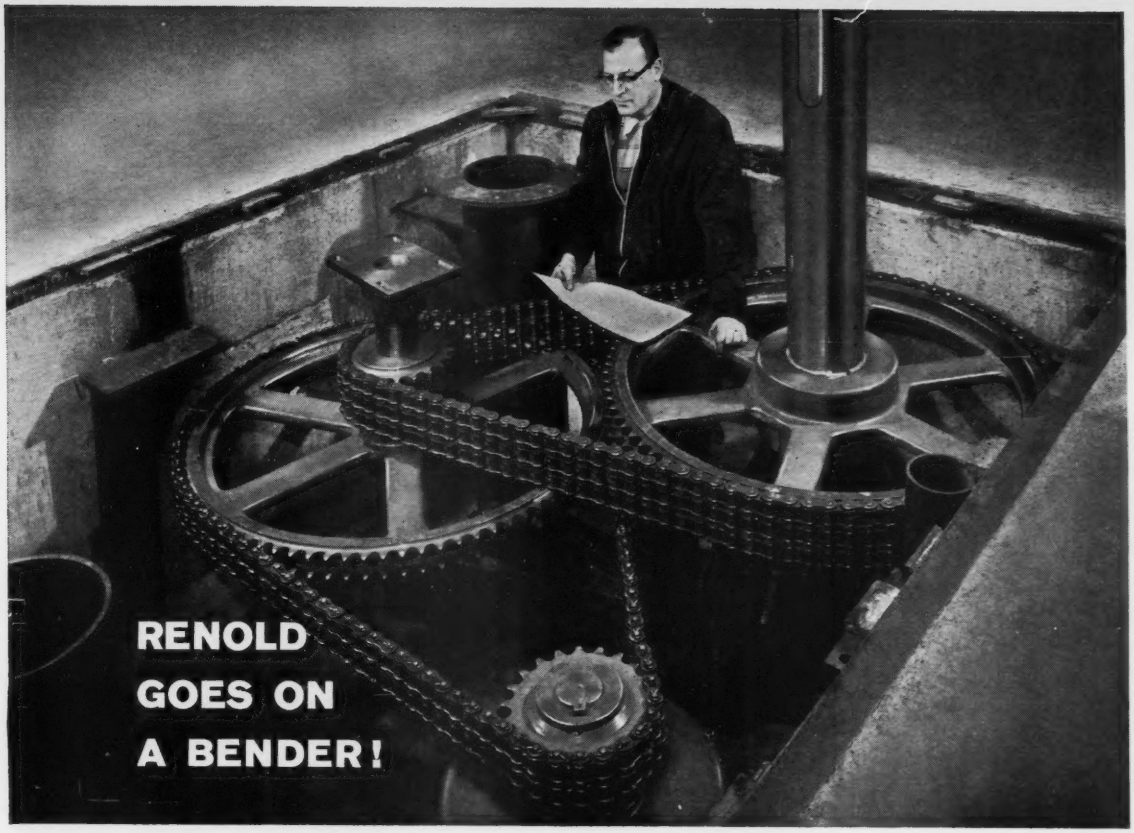

Crane Piping Ltd., Hamilton, uses this machine to bend 36 inch diameter fabricated steel pipe. Its power comes from a Renold Roller Chain Drive and Holroyd Speed Reducer and Renold Coupling —supplied by Renold Chains Canada Ltd.

It does the job efficiently and economically—and, most important, it's designed to do its heavy work for years with a minimum of maintenance.

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This unique application of Roller Chain meant a major dollar saving to Crane Piping Ltd. The use of a conventional double reduction speed reducer—the only alternative to the chain drive—would have *more than doubled* the cost of the machine.

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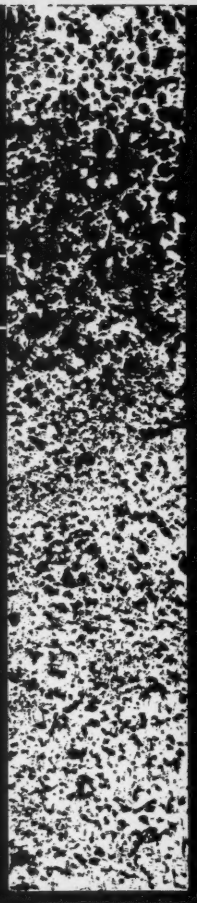

NOZZLES

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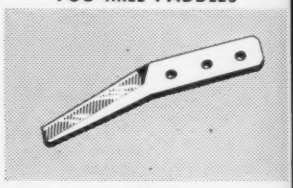
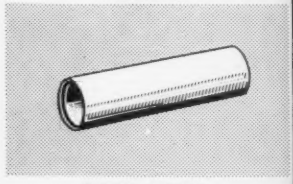
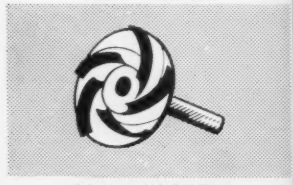


KNIVES



PUMP SLEEVES



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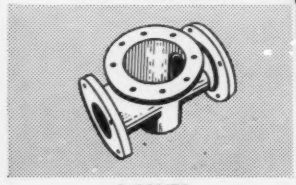
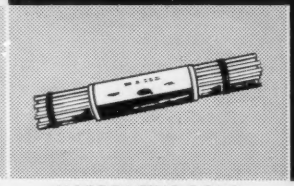


VALVES



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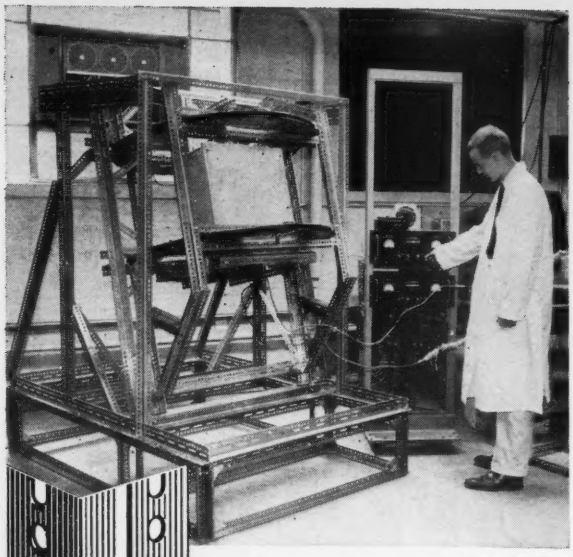

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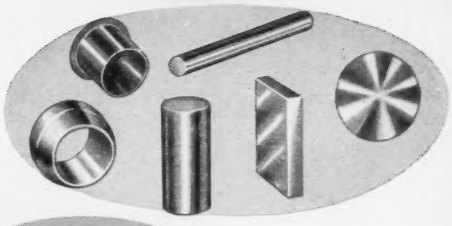

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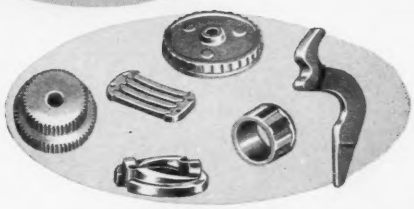

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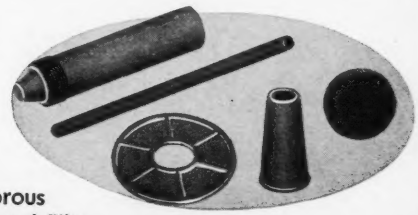

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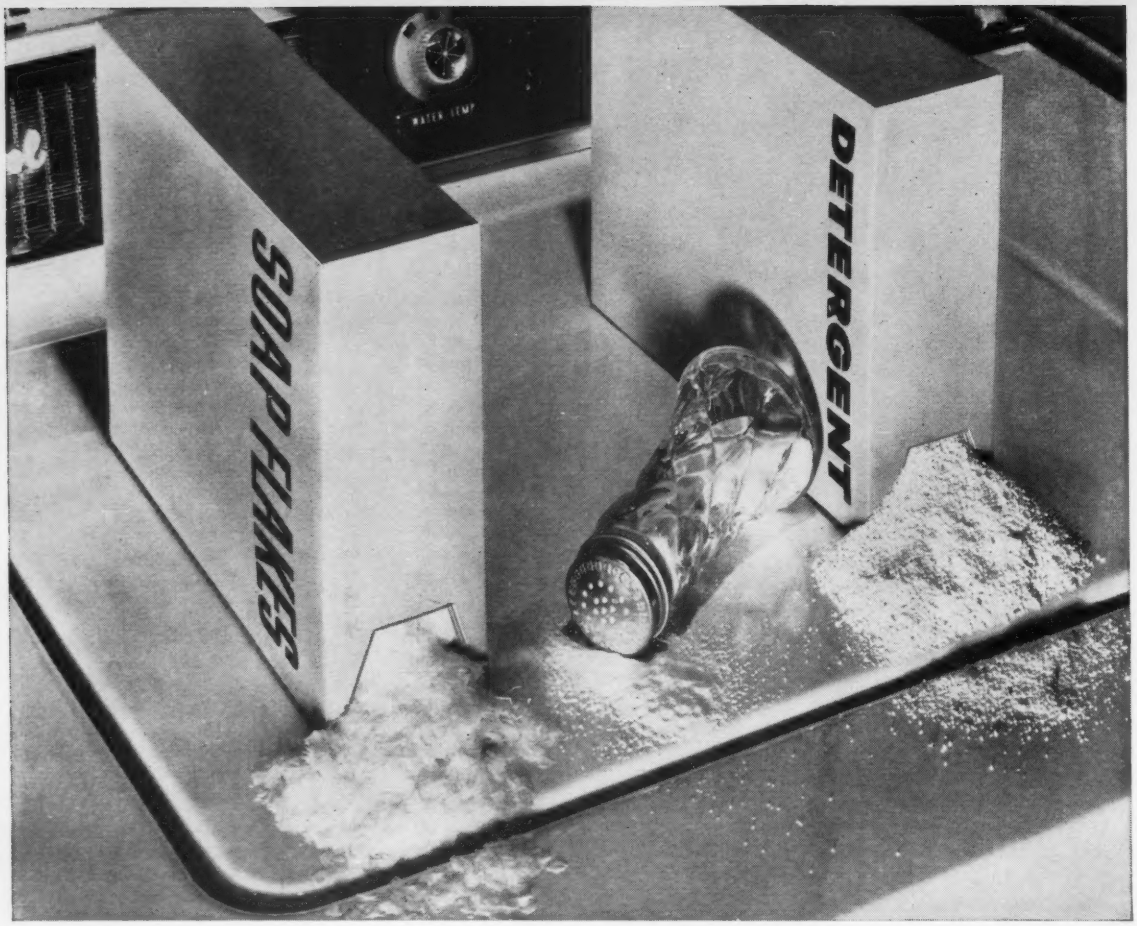

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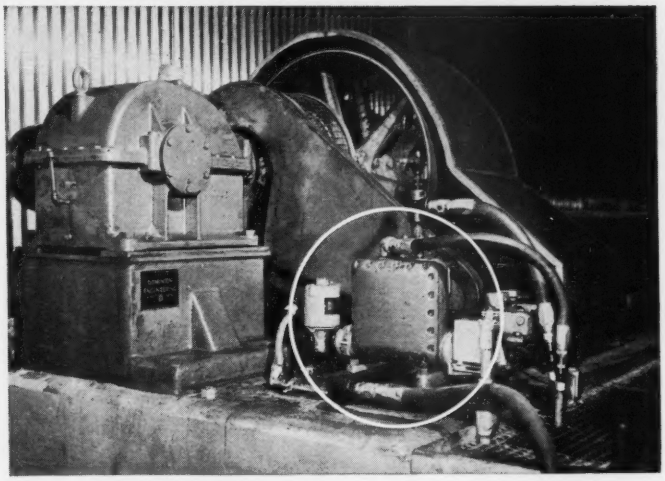
Hydraulic Drives Improve Paper Quality



Variable displacement hydraulic pump (driven from main drive shaft of couch roll drive) supplies hydraulic motor on presser roll (see below). Pump output is controlled from console. More than 500 different standard pumps are available through Vickers-Sperry.

Compact piston-type motor is easy to mount, offers ruggedness and dependability. Vickers-Sperry offers a complete range of fixed and variable displacement motors.

Matching speed of pressure and couch rolls prevents slipping, insures better quality paper. Maintenance requirements are down materially.

A design that combines rugged strength with precise control keeps the newest paper machine at Howard Smith Paper Mills, Ltd., Cornwall, Ontario, on-the-line producing an outstanding product. The machine was designed and built by Dominion Engineering Works, Ltd., Montreal, Quebec. Hydraulic drives, supplied by Vickers-Sperry of Canada, Ltd., are typical of the quality components that give the new machine performance advantages not found on earlier models.

On the presser roll drive illustrated, for example, the compact hydraulic motor drive keeps it turning at the same surface speed as the couch roll to squeeze water out of the wet stock. Because the speed of the two rolls is matched precisely, high quality paper is produced. Small speed changes, when required, are made easily by depressing a push-button at the control console.

Hydraulic drives offer other advantages, too. They are not damaged when the machine is flushed down with water or if the roll suddenly stops or is forced to slow down. Maintenance requirements are down sharply over installations using chain or belt drives. Because hydraulic drives offer constant torque, they are ideal for this roll application.

Application engineers at Vickers-Sperry offer Canadian machinery builders and users a broad base of experience in hydraulic drives and controls. In addition, they can select from the most extensive line of hydraulic equipment available anywhere to insure performance matched to your installation needs. Refer your problem to the Vickers-Sperry office nearest you. Write for Catalog 5001C.

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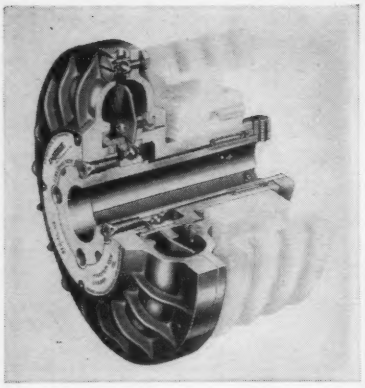
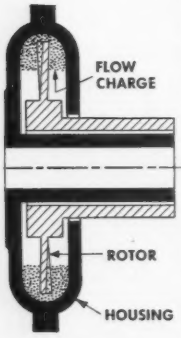
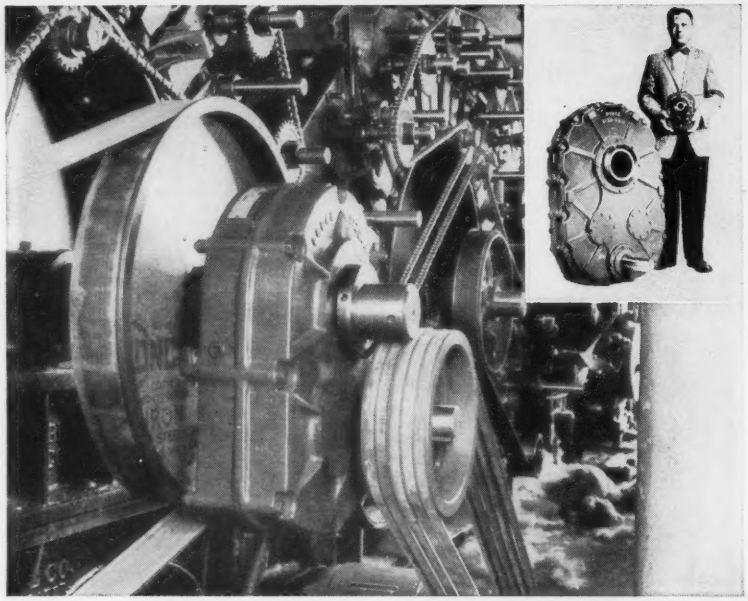
PRODUCT NEWS

FROM UNITED STEEL CORPORATION



FLEXIDYNE "Dry Fluid" Drives and Couplings provide a new way to: start loads smoothly, protect against overloads; reduce maintenance; save on motors and controls. The "fluid" in Flexidyne is heat treated steel shot. A measured amount, called the flow charge, is contained in the housing, which is keyed to the motor shaft. When the motor is started centrifugal force throws the flow charge to the perimeter of the housing, packing it between the housing and the rotor which transmits power to the load. After the starting period of slippage between housing and rotor the two become locked together and achieve full load speed, operating without slip and with 100% efficiency. The Dodge Flexidyne Drive is available to handle from ¼ HP. to over 800 HP. **No. 6801.**





TORQUE-ARM SPEED REDUCERS— "Torque-Arm" is a precision built power package which simplifies problems of speed reduction and in so doing cuts the cost of equipment, installation and operation.

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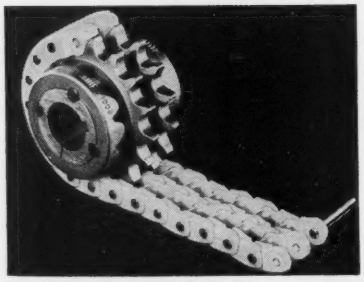

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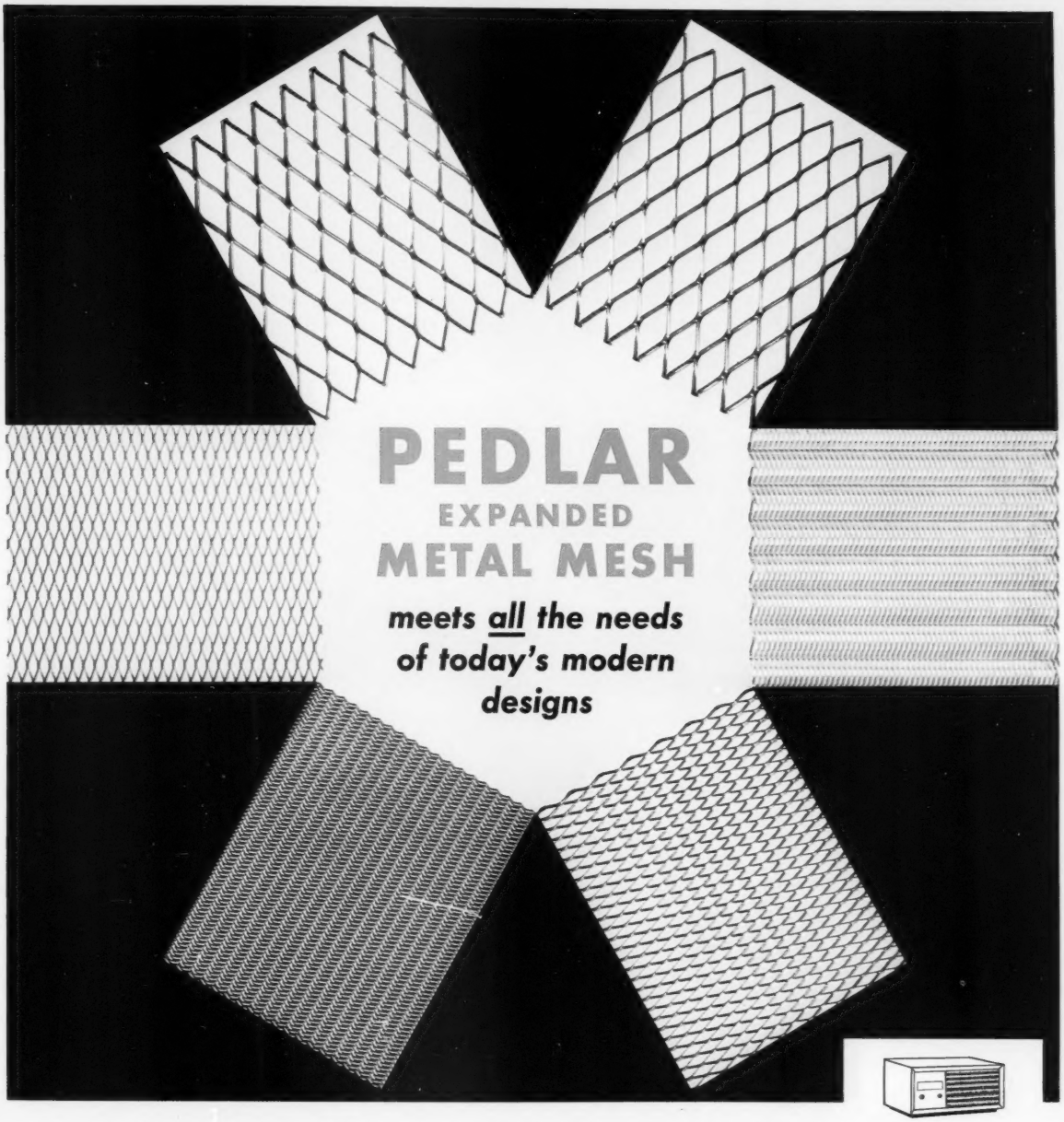

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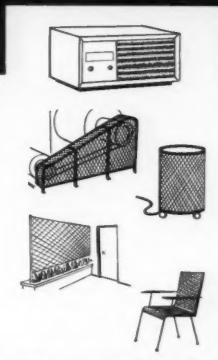

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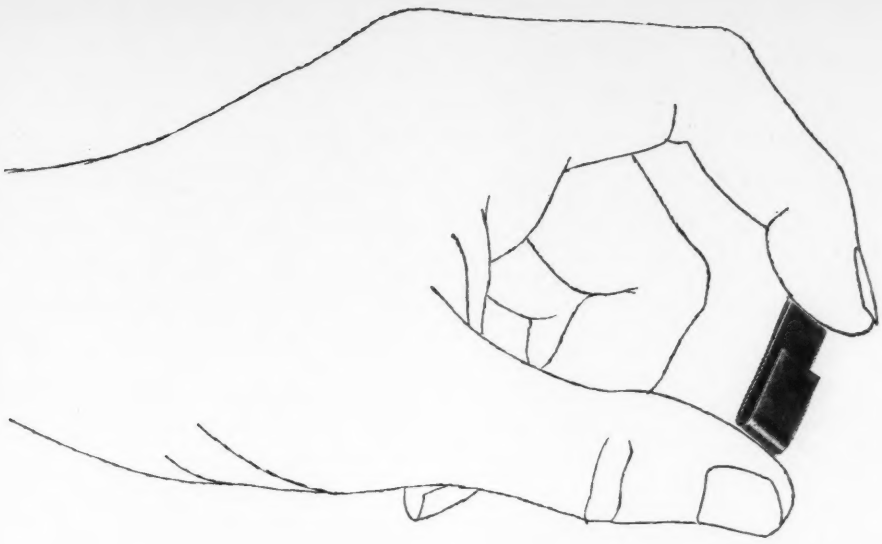

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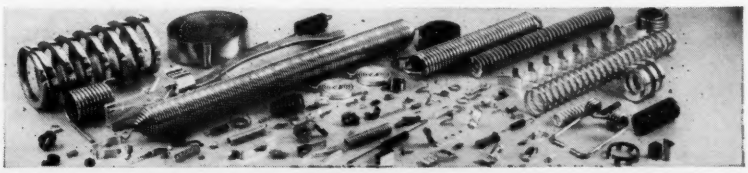

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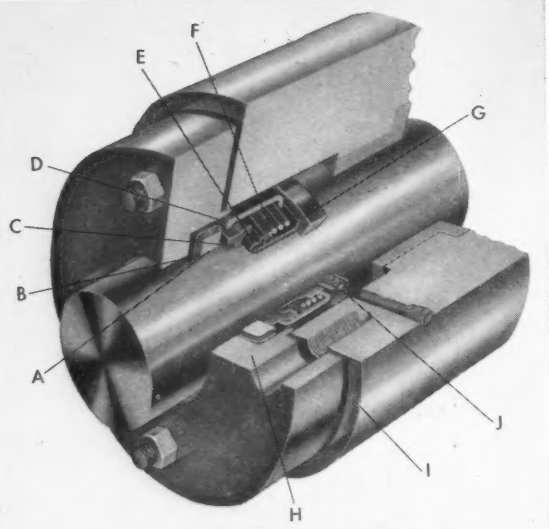

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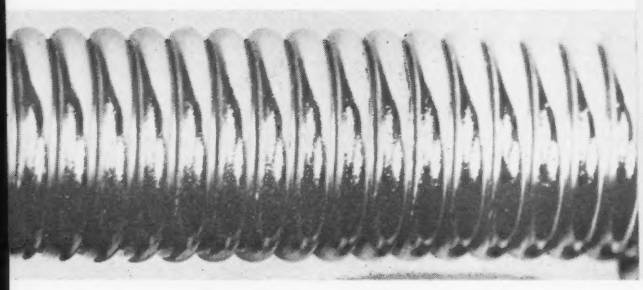


Selecting the right spring material is easy when you follow these rules

V. A. Stanton, Chief Metallurgist of National-Standard Company

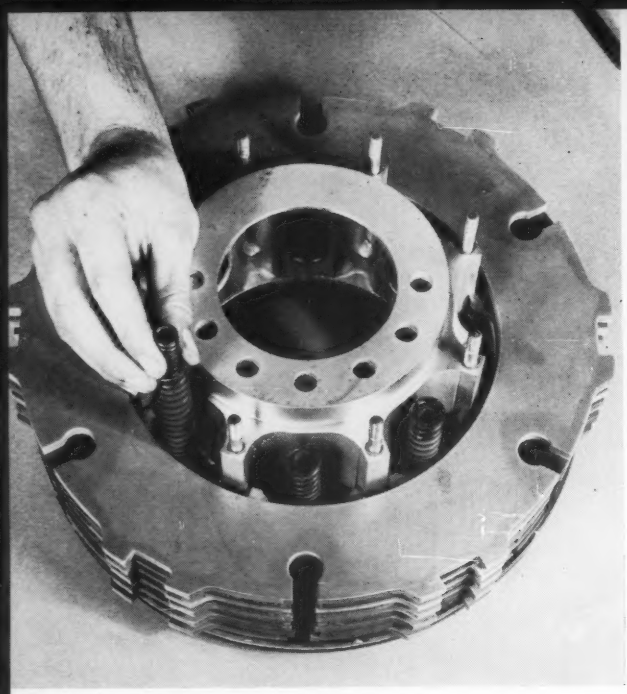
offers rules on the selection of superalloys for springs to meet the demands of today's high-temperature applications

Superalloy materials for operation at 400 to 1400 F are becoming increasingly important. As aircraft speeds increase and as missiles and rockets come into more prominence, the need becomes great for stressed members that can operate predictably and accurately at such temperatures. Many special alloys are used in aircraft fuel control systems, instruments, electric motors, brakes and in high temperature wire tires. Even atomic-powered submarines require some unusually high-temperature springs.

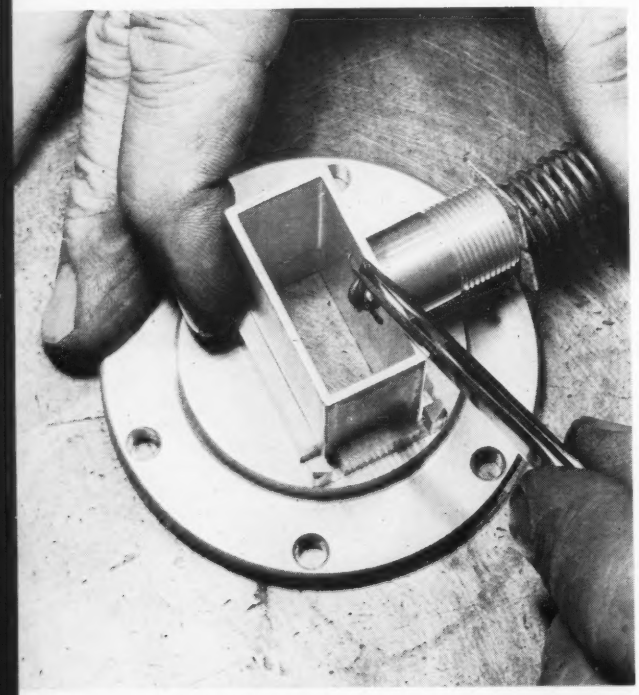
Consumer products using high-temperature alloys include springs in automatic toasters operating at 400 to 600 F to pop up the toast, springs in electric iron controls, and improved electric light contact springs. Industry is using these materials in valve springs and as a mechanical fastening device in silver brazing. If turbine engines are used widely in automobiles, applications for high-temperature spring materials will increase considerably.

Many to choose from

Superalloys include a number of materials. One recent tabulation listed 103 that are merely representative alloys thought to be the ones that show the most promise in their respective groups. Those described here are representative alloys from each group.



Brake springs must withstand temperatures up to 1000 F. They separate stator disks from rotor disks in jet aircraft.



Threaded collar is held against waveguide tube by applying spring and slipping small wire through hook in end of spring.

All of these materials are precipitation hardenable in the 800 to 1500 F range. By stress relieving springs in the precipitation-hardening range, both stress relieving and hardening are accomplished in one operation. The higher the temperature at which precipitation hardening occurs, in general, the more stable will be the springs at elevated temperatures.

Ferritics are modified tool steels

Ferritic alloys such as Vascojet 1000 are modified tool steels containing relatively small amounts of chromium, vanadium and molybdenum. Although cheaper, low alloy content of ferritics is undesirable in many applications requiring corrosion resistance. From a spring-maker's viewpoint, the major concern is that wire be formed in a soft condition and then quenched and tempered to achieve maximum physical properties. This has been done on larger ferritic springs and forms, but distortion problems and cost considerably limit the use of this material.

Ferritic-austenitic 17-7PH has attained wide use up to about 550 F, while the newer PH15-7MO has been used to a limited extent. The 17-7 alloys consist of austenite containing 5 to 20 percent delta ferrite and can be hardened by precipitation hardening or by combination freezing-precipitation hardening.

NS-A286 is an austenitic alloy which is proving to be a very interesting spring material. This is one of the least expensive of the superalloys. With the high temperature of the precipitation reaction (1300 to 1400 F), it is proving satisfactory for applications where more costly alloys are now used.

Inconel X well established

Inconel X, a nickel-base material, is a very good alloy for which considerable spring data is available . . . including many relaxation tests at various stress levels and on wire in different conditions of stress relief. This alloy has proved to be of excellent quality. Before using other more exotic and more expensive materials, tests should be made to determine whether or not Inconel X would be satisfactory for a given job.

Rene' 41 is a vacuum melted nickel-chromium-cobalt material that has proved to be exceptional in high-temperature structural applications. Spring applications are now being studied in the 1200 F plus range. Refractaloy 26 and Waspaloy are also nickel-base alloys being considered for high-temperature use. NS-25 and S816 are 40 to 50 percent cobalt-base alloys. At present, NS-25 is used in springs at 400 to 1400 F.

Melting and processing

Superalloys are melted in small heats of 100 to 20,000 lbs. The type of melting . . . such as vacuum, air, or combinations of these and still other methods . . . depends on the alloying elements present. Some alloys cannot be melted in any manner except vacuum while others can be melted either way. The only vacuum-melted alloys considered for spring wire to date are materials such as Rene' 41 and Waspaloy. Due to a high percentage of reactive elements such as titanium and aluminum, these cannot be melted in air. Other alloys are melted by air-arc or air induction, depending on quantities.

After melting and rolling into hot rod, some alloys are drawn through one pass and centerless ground. This adds considerable cost, since .010 to .040-inch may be ground off the diameter. This is sometimes necessary, however, to obtain a surface of spring wire

Table 1

Chemistry of superalloy spring materials

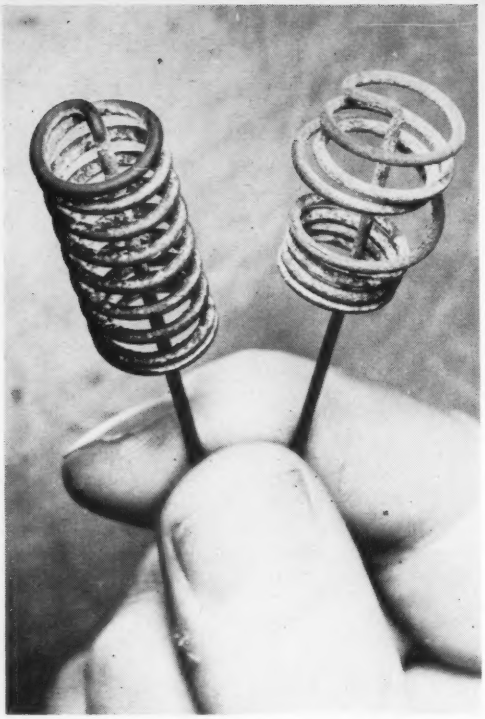
Alloy	Class	CO,%	CR,%	NI,%	MO,%	Fe,%	C,%	Al,%	Ti,%	Cb,%	W,%	V,%	B,%
NS-1000	ferritic		4.75 to 5.25		1.2 to 1.4	balance	.37					.4 to .6	
17-7 PH	ferritic austenitic		16 to 18	6.5 to 7.5		balance	.09 (max)	.75 to 1.50					
PH15-7MO	ferritic austenitic		14 to 16	6.5 to 7.5	2 to 3	balance	.09 (max)	.75 to 1.50					
NS-A286	austenitic		13.5 to 16	24 to 27	1 to 1.75	balance		.35 MA	1.75 to 2.25			.10 to .50	
Inconel "X"	nickel base	1 (max)	14 to 17	69 (min)		5.9	.08 (max)	.4 to 1	2 to 2.5				
Refract-aloy 26	Ni-Co alloy	20	18	38	3.2	balance	.03	.2	2.6				
Rene' 41	Ni-Co alloy	10 to 12	18 to 20	53	9 to 10.5	5.00	.06 to .12	1.5 to 1.8	3 to 3.3				.010 (max)
Wasp-alloy	Ni-Co alloy	13.5	19.5	56	4.25	1.00	.05	1.3	3.00				.005 (.062R)
NS-25 (L605)	cobalt base	50	19 to 21	9 to 11		3 (max)	.05 to .15				14 to 16		

Table 2. Guide to selection of alloy temper for given temperature range

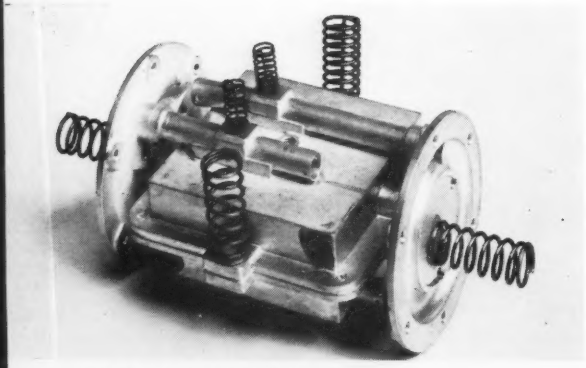
Alloy temper	Operating temperature
Spring temper or 30%	300° to 600° F
30% or 15%	600° to 900° F
15% or annealed	Over 900° F

Table 3. Tensile strength as drawn and after aging. Wire dia. .080″

Temper	Tensile as drawn	Suggested hardening treatment	Tensile after hardening
17-7 PH			
Spring	237,000	1 hr. 900°F.	301,000
30%	178,000	″ ″	197,000
15%	152,300	″ ″	148,000
PH-15-7MO			
Spring	256,000	1 hr. 900°F.	320,000
30%	182,000	″ ″	211,000
15%	146,500	″ ″	152,000
NS-A286			
Spring	184,000	16 hrs. 1350°F.	236,000
30%	150,000	″ ″	198,000
15%	122,500	″ ″	190,000
Annealed	105,000	″ ″	176,000
Inconel-X			
15%	149,000	16 hrs. 13-1350°F	204,000
Annealed	120,500	16 hrs. 1400°F.	176,000
Rene' 41			
45%	294,000	16 hrs. 1350°F.	327,000
30%	272,000	″ ″	298,000
15%	220,000	16 hrs. 1450°F.	240,000
Annealed	191,500	″ ″	217,000
NS-25			
30%	207,000	16 hrs. 1300°F.	205,000
15%	178,500	″ ″	176,500
Annealed	148,000	16 hrs. 1500°F.	148,000



NS-25 spring, left, survives several hundred brazing operations. Stainless spring is deformed after 1100F operation. Spring holds parts together for brazing.



Here is an interesting example for control and mounting purposes.

quality. Whether a material has to be centerless ground depends on the quality of the hot-rolled rod, on the alloy's notch sensitivity or disposition to cracking during cold drawing, and on the ultimate application.

Centerless grinding presents another problem. Lengths that can be ground are usually limited to 10 to 15-ft. Drawing to fine wire requires many welds. If the material were not welded, finish coils would be so short that automatic spring forming would be impractical. So, a magnetic material is welded in at the joints. Springs containing a weld can be identified by checking all finished springs with a magnet.

Superalloy spring wires for automatic coiling, coated with a lime-base lubricant, are proving very satisfactory. The lubricant can be left on the wire during stress relieving or it can be removed by a dip in 20% nitric acid before stress relief.

Since stress relief and precipitation hardening are both done above 1000 F, scale is often formed if a protective gas atmosphere is not used. If excessive scale forms, vapor blasting will remove it.

How to select an alloy

For a material to operate at a given temperature, the following must be considered:

- Stress
- Time at temperature
- Stability required
- Cyclic conditions of temperature and stress
- Environment

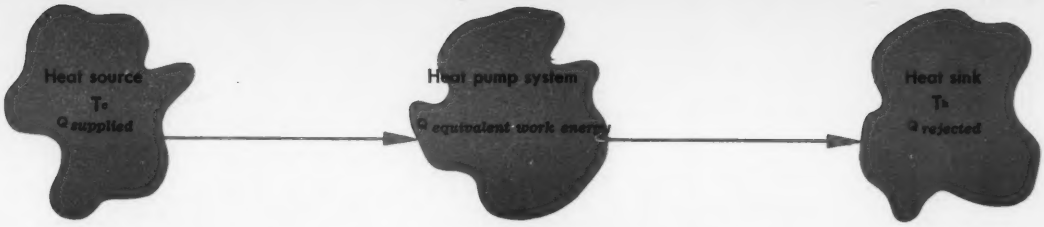
Full hard, or so-called spring temper, is not always the most satisfactory from a stability viewpoint for superalloys operating above 500 F. Spring temper materials achieve their high physical properties by cold drawing and then precipitation hardening after forming into springs. For room-temperature or low-temperature applications up to about 450 F, a material with the highest possible tensile strength is desirable. As operating temperature increases and additional stability is required, however, the design stresses for the spring must be decreased to prevent excessive relaxation.

Tests show that as the percent final reduction in cross sectional area decreases, the alloy becomes more stable at a given elevated temperature providing the design stresses do not exceed the yield point of the material.

As operating temperature increases and the stress correspondingly decreases, the wire tensile and other physical properties should be decreased to obtain maximum stability. If a spring is to operate at 600 to 800 F, the material should be tried in several different tempers depending on the stresses involved.

As operating temperatures go above 1000 F consideration should be given to aging the material at temperatures higher than that which result in the maximum of physical properties. Over-aging may result in more stability even though physical properties are not optimum. If material given the usual aging treatments is not stable enough, a treatment at 100 to 200 F higher for the same length of time may be worthwhile.

Perhaps the singularly most important revelation, in summary, of the data collected on superalloys so far is that stability is improved if temper is decreased as operating temperature increases above 600 F. Beyond this generalization, selection of superalloy spring materials rests on individual considerations of corrosion, temperature and load cycling, heat treatment, and fabrication methods. ★



Are heat pumps practical in Canada?

In outlining the basic principles, consulting engineer G. M. Nixon, P.Eng., shows the practical advantage of the once-theoretical heat pump design

The heat pump has at last progressed from theory to a practical reality. Engineering study is being given by societies, manufacturing companies and home owners to this radically new method of heating without the nuisance of combustion.

Most modern heat-pump research is directed toward finding suitable energy sources and developing efficient means of utilizing that energy. The use of outdoor air, for instance, requires large air volumes, with resulting high capital investment and fan-operating costs. City, well, or ground water carry the burden also of high cost, unavailability, and legislative restrictions. The earth has tremendous thermal storage capacity, hence the problem is one of accessibility rather than quantity. Solar energy is still experimental, but the prospects are limitless.

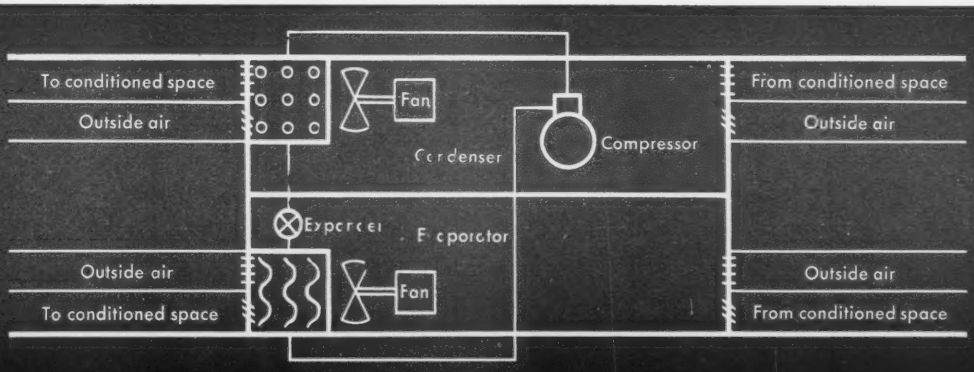
What is a heat pump?

The heat pump may be defined as a device for absorbing heat from one medium at a relatively low temperature, and delivering that heat to another medium at a relatively higher temperature. Such a device has two practical applications. The desired effect may be the removal of heat from the low-temperature source to either make the temperature lower or to maintain a steady temperature. This system we all know to be a refrigerator. If the desired effect is the reverse, that is, to supply heat to the heat sink, then we call the system a "heat pump." Both applications are actually heat pumps inasmuch as they pump heat from one energy level to another. The useful output, and the chief design parameter, therefore depends upon the use to which the unit will be applied.

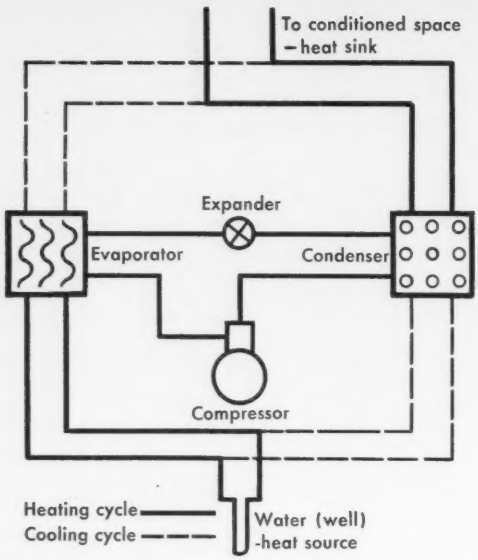
The question is often asked: how can heat be pumped from a colder source to a warmer space or sink, as it is commonly called. To understand this one must know a little of the nature of heat. The important thing to realize is that heat itself is a form of energy and must not be confused with temperature, which is simply the measure of the quantity of heat.

In the last few years the first practical system of heating a building without the use of fuel has been perfected. One installation which used freezing outside air as a heat source was first demonstrated at the Canadian Electrical Association annual meeting at Niagara Falls, Ont., three years ago.

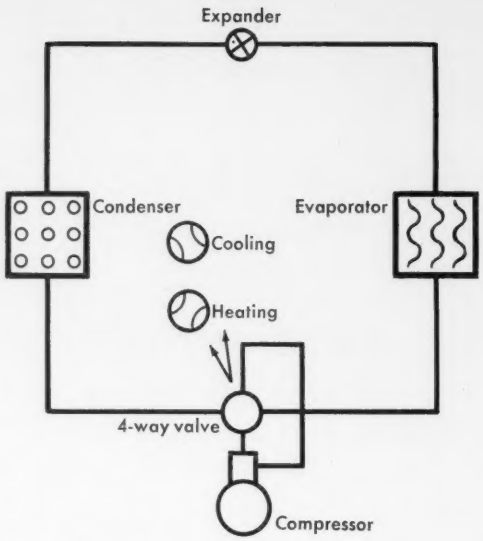
Three distinct types of heat pump are presently known and being further developed. These are the Peltier, absorption and compression. Relatively high development has been reached in the commercial heat pump of the compression type. The absorption system is undergoing development, while the Peltier type is still



Basic heat pump cycle — air to air fixed refrigerant circuit . . . top: heating . . . bottom: damper reversed for cooling



Basic heat pump cycle—
water to water
fixed refrigerant flow



Basic heat pump cycle—
change in
refrigerant flow direction

in the experimental, or laboratory state. Our further discussion will concern heat pumps using the vapor compression cycle.

Present-day research

The heat pump is mechanically comprised of a compressor, condenser and evaporator, with the accessories required to make up a complete refrigeration system. Most present-day heat pump research is being directed toward finding suitable energy sources and developing more efficient means of recovering that energy.

Planck's statement of the second law of thermodynamics states: "It is impossible to construct a device that, operating in a complete cycle, will produce no effect other than a transfer of heat from a cooler to a warmer body."

For a reversible cycle this is written $dQ/T=0$. (Peabody's mathematical expression). Clausius stated: "It is impossible for a self-acting machine, unaided by any external agency, to convey heat from one body to another at a higher temperature." Carnot's law states in effect that the efficiency of a perfect engine does not depend on the nature of the working fluid but on the temperatures of the sources of heat and refrigeration.

Maths of the process

The coefficient of performance (COP) may be defined as the ratio of the useful performance to the heat equivalent of the work required to produce that effect. For a refrigeration system:

$$Q \text{ supplied} = A.W.$$

and for a heating system:

$$Q \text{ rejected} = A.W.$$

This applies to all heat pumps, whether ideal or operational. For the reversed Carnot cycle (2 isothermals + 2 adiabatics):

$$COP = T_1/(T_2 - T_1) \quad \text{for cooling}$$

and

$$COP = T_2/(T_2 - T_1) \quad \text{for heating}$$

where, of course, $T_2 > T_1$. Thus, for cooling, the COP will be numerically one less than the COP for heating.

No refrigerating machine has yet been developed that will operate on the reversed Carnot cycle. Its efficiency represents a theoretical maximum which gives a standard against which performance of actual cycles and engines may be measured.

From heating to cooling

A heat pump may be changed from a heating to a cooling machine by simple mechanical means, such as dampers or valves. These can leave the function of the two heat exchangers either changed or unchanged. In either case the various steps of the refrigeration cycle remain unchanged.

Because of thermal irreversibility in the present-day heat pump, the ideal cycle cannot be reached. Means of more closely approaching this ideal include multistaging (using two or more condensers and evaporators), or return to a modified form of the Kelvin air cycle. For the heat pump, the linked-air cycle possesses appreciable theoretical advantages over the vapor-compression cycle, and the previous practical reasons for abandoning the air cycle are no longer valid.

Operation of air source heat pumps is influenced by variations of outdoor dry and wet bulb temperatures. This effect has delayed and limited the use of this pump in Canada, where severe winter conditions are encountered.

Design and application factors include geographic location, architectural aspects, ventilation requirements and the need for simultaneous heating and cooling. The last condition is a very interesting consideration.

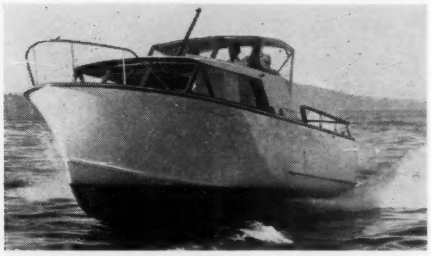
The trend in modern buildings is to more internal areas, with higher internal heat loads from lights, people and equipment. There is thus a need for air-conditioning systems which simultaneously furnish heating to the exterior zones while cooling the interior area. The heat pump is an ideal solution to just such a problem. It usually shows considerable savings in both capital cost and operating cost, when compared with other types of air-conditioning and heating equipment. ★

This lightweight turbine is to replace a conventional jeep engine in an army test program.

40-ton ore hauler is powered by a turbine lighter than the standard engine.

Gas turbine — a hot idea in engines

Combating the high heat problem is major worry of today's design engineers



260 hp inboard gas turbine drives this 26 ft cruiser to top speed of 33 mph.

A revolutionary engine—the gas turbine—looms as the next significant performance improvement to be offered to motorists and boating enthusiasts. Already gas turbines are in broadening use in an array of heavy duty ground vehicles (from 40-ton ore haulers to fire trucks) and smaller production versions for Canada's passenger cars may not be far off.

The gas turbine has been called the "ideal" powerplant for the automobile, and with good reason. It combines lightness and smooth delivery of power in a compact, trouble-free unit. It is easier to start and is less critical in its fuel requirements than present-day engines and it eliminates the need for a conventional transmission, radiator, muffler, and conventional ignition system.

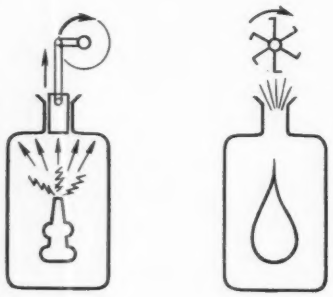
Automobile engineers have been intrigued by the simplicity of the gas turbine for many years. It has about one-fifth as many parts as a conventional piston engine, needs only one spark plug (and uses that only for starting), is virtually vibration-free (because combustion is continuous rather than periodic), and its few moving parts rotate smoothly on ball or roller bearings. In addition to its superior low-temperature starting characteristics, it will operate on practically any

liquid fuel, including home heating oil, and releases a relatively clean exhaust.

The principle behind this automotive engine of tomorrow is by no means new. As far back as 130 BC, a crude, steam-powered turbine was built, a gas turbine featuring all the elements of modern versions was designed in 1872, and an operating gas turbine was successfully built in the early 1900's. World War II spurred the aviation industry to develop turbine-powered aircraft and today, uncounted millions of miles have been flown in modern turbine-powered passenger and military planes. A number of Canadian firms are manufacturing turbines for power and other applications.

How turbines differ

There are major differences between a turbine engine and the more familiar piston engine. Greatly simplified, the piston engine is like a bottle, made of metal, filled with a mixture of gasoline vapor and air, and stopped with a metal cork. The mixture is ignited by means of a spark plug and, when combustion takes place, the expanding gases push against the cork or piston which is linked to the crankshaft and the push is changed to a rotary motion to turn the car's wheels. For each succeeding power impulse, fresh gas and air are admitted and ignited by intermittent spark plug action.



In a turbine engine the cork is replaced by a fan with many blades and air is forced into the engine in a steady stream by means of a compressor. Combustion occurs when the fuel is added. A spark plug starts the ignition process, but the burning gas itself provides the continuing combustion that is much like a burner on a kitchen stove. The hot expanding gases spin the fan and the push is delivered directly as a rotary motion. Because air and fuel are steadily fed into the turbine, combustion is continuous and smooth.

Overcoming the heat problem

One of the biggest challenges turbine engines present to the ingenuity of design engineers is heat. Interestingly, the work of missile experts, as well as that of automotive engineers, pointed to the answer. Even decades ago, it was not very difficult to build a turbine engine—the problem was keeping it together. The raging tornado of white hot gas promptly and completely burned the blades off early turbine wheels and burned through turbine castings.

In their search for a material that would withstand the enormously high temperatures and violently corrosive gases found in turbines, engineers decided that the unique combination of characteristics of stainless steel suited the metal ideally for many turbine components where abuse is greatest. This was a logical choice since stainless has long been recognized for its resistance to corrosion. Indeed, stainless is able to withstand such withering temperatures that the metal is used to sheath missiles and parts of rocket planes.

As temperatures and stresses in the gas turbine engine under development continue to climb, stainless steel will probably move into new sections of the engine. Currently, one automotive turbine engine uses more than 50 pounds of the metal in turbine and compressor section parts where high heat, high rotational speeds and corrosive gases require special properties.

Other design problems

Efficiency was one problem that long retarded the development of turbines for automotive uses: you couldn't get many miles on a gallon of fuel. Acceleration was another problem. Vehicles with early turbine engines gained speed very slowly. A third big drawback is that the gas turbine engine normally doesn't provide any braking action when you take your foot off the accelerator; your brakes have to do all the work.

Each of these problems has either been solved or else seems close to solution, many engineers believe. Within the last few years, for example, turbine-powered cars have been driven coast-to-coast in the USA, most recently averaging 19 to 20 miles per gallon on various types of fuel. And a number of 225 horsepower turbines, in daily use in heavy-duty vehicles, have been described as "extremely economical to operate." A turbine-powered pumper truck, recently added to one city's fire-fighting force, roars to 50-mph speeds from a cold start in 45 seconds—an important 15 seconds quicker than conventional equipment.

Research, development and refinement continue. Each advance, whether it is a new design for a turbine blade or the selection of material in a new area to overcome intensified heat and corrosion problems, bring the gas turbine engine with its advantages nearer to the motorist. Industries learn from each other: the flight of a turbine-powered plane in Great Britain in 1941 undoubtedly influenced the first official tests of a gas turbine in an automobile by the Royal Automobile Club nine years later.

More and more experimental turbine - powered vehicles are being developed and tested—from heavy-duty trucks that will carry bigger payloads to high-speed "specials" that will try to break the land speed record of 394.196 mph set in 1947 by the late John Cobb. Nor has development work been confined to land vehicles. Hottest news for pleasure boating enthusiasts was the recent announcement of a low-cost 125 horsepower gas turbine outboard, which is scheduled for early delivery to the US Navy and, if demand warrants, later to the boating public. A 260 horsepower gas turbine inboard engine also has been announced for 26-foot (and bigger) cruisers.

Summing up the performance—and problems—of these engines, one auto expert called them "the hottest things on wheels"—or (we might add) afloat. And one day the average motorist or pleasure boater will be able to check this evaluation himself.

Widespread use of the turbine engine in automobiles and pleasure boats is still in the future—but a future that is far from a dream and close to a reality.

Canadians design new tower, antenna

Ray Tulloch, DE's Winnipeg correspondent, tells how engineers met a difficult design challenge

From aircraft to communications equipment would seem like a big jump but, in the case of one large western Canada plant, it has proved to be a logical sequence in employment of existing engineering and manufacturing skills.

A shift in Canada's air defence policy in 1958 left Bristol Aero-Industries Ltd., (Winnipeg Division) with some highly skilled engineers and specialized machinery literally looking for a product to turn out.

Before the end of 1960, however, Bristol had developed a number of new products, among them a tower and antenna "package" for the communications field.

New vacuum forming process devised

In this connection Bristol's engineering and development laboratory devised a new vacuum forming process for the manufacture of parabolic reflectors resulting in a high degree ot surface contour accuracy. At the same time the company has gained considerable experience in the fabrication of waveguides and various other components.

Completing its "package" concept Bristol has developed a range of guyed towers capable of rigidly supporting heavy installations at great heights. An example of one of these towers is now standing at Elie, Man., forming the main link in the Manitoba Telephone System's proposed heavy route relay system between Winnipeg and Portage la Prairie. The company won the contract for this 350-foot tower late in 1960.

Initially the Elie microwave tower will have two 10-foot diameter parabolic reflectors mounted on its 21-foot-square platform. It is designed to support four cornucopia antennae. In this event the tower will be supporting a total dead load of more than 12,000 pounds at a height of 330 feet.

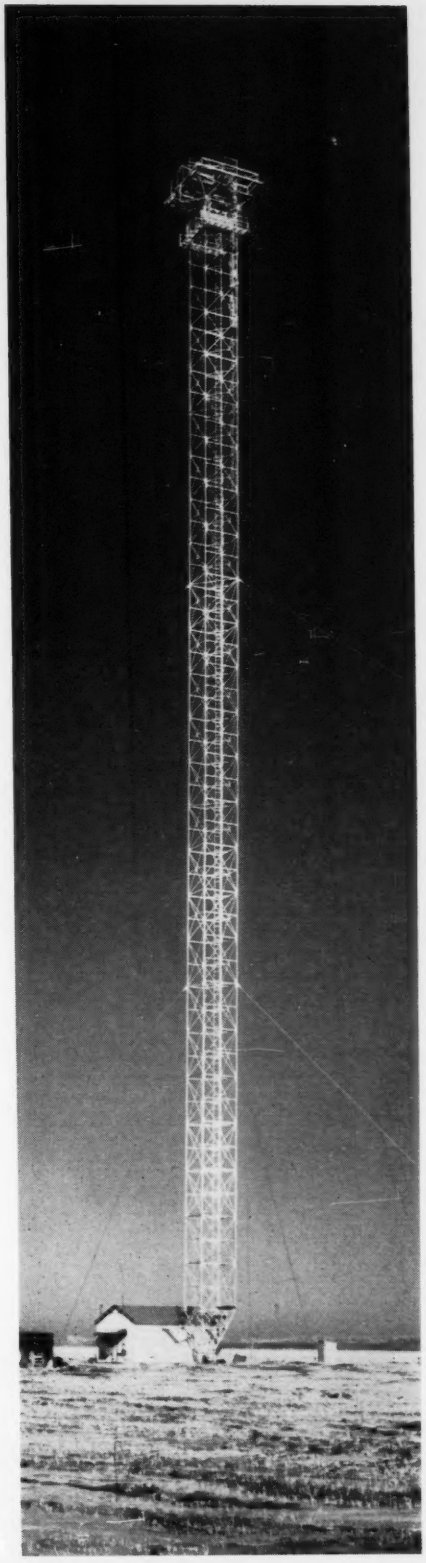
The entire guyed structure was designed to meet current CSA specifications and will be, in effect, doing the same job for a lower cost than an equivalent free-standing tower.

Design specifications were rigid

Design specifications that had to be met for the Elie tower were very exacting. Maximum deflection specified was $\pm$ 1.25° and the maximum twist allowed was $\pm$ 0.8°.

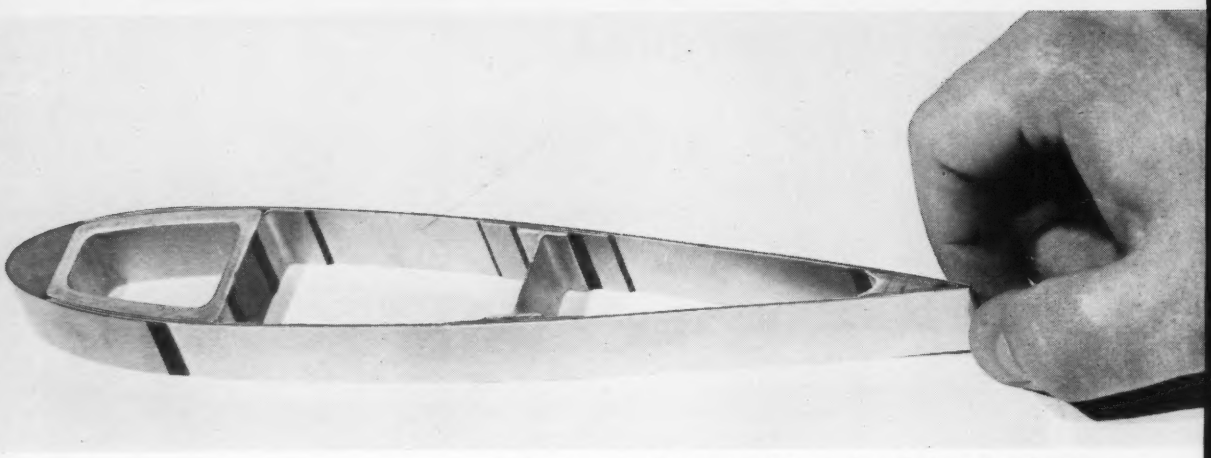
Bristol engineers, after analysis of soil conditions at the Elie site, developed an unusual design for guy cable anchors which proved to be more economical than the conventional type. Primarily suited for use in prairie locations, the design involves long concrete piles set into the ground at an angle. The Elie tower "package" also included a comprehensive failure warning system for the obstruction lighting.

The MTS contract was one of a number of design projects in the communications field undertaken by Bristol Aero-Industries' Winnipeg plant to date. Production of the FPS 20 antenna and other similar radar components led the company into this field in the past few years. Bristol's manufacturing processes, machines and skilled staff enable the company to provide a very competitive approach to the communications field.



350-foot tower will support four cornucopia antennae

Part 3: Application methods



Helicopter rotor blades assembled entirely with structural adhesives.

Adhesives open new design potential

The method of application is as important as design, says H. J. Jankowski of Minnesota Mining and Manufacturing of Canada

Honeycomb sandwich panel construction is an excellent example of the new designs made possible through the use of adhesives. Sandwich construction consists of a lightweight core, sandwiched between two relatively tough, thin skins of metal. Cores consist of thin metal foils (or resin-reinforced paper or glass fabric), constructed in a cellular pattern resembling honeycomb.

Such core constructions are sawed "across the grain" into sheets of desired thickness. Adhesives are used in the assembly of core materials and in the attachment of skins to the cores.

The light metals, aluminum and magnesium, can now be joined more strongly with adhesives than by any other method.

For example, aircraft floors, wings, stabilizers, trailing edges and radar housings utilize increasing amounts of honeycomb structures. These are usually prefabricated with "composite bonding films". The films are actually laminations of phenolic elastomeric films and solid epoxy-types with scrim cloth or glass fibre between the laminations to prevent the honeycomb edges from cutting through the film under pressure.

The elastomer type is set next to the skin to give high peel strength and the epoxy type next to the honeycomb to give a good filleting action to anchor the edges.

Aircraft applications are many

Aircraft applications also take advantage of the excellent fatigue resistance of metal-to-metal adhesives. The importance of fatigue strength is recognized in the U.S.A. Military Specification MIL-A-5090B which states that joints must remain intact after 10 million cycles under a fluctuating load from 0 to 600 psi. Several commercially available adhesives greatly exceed this figure today.

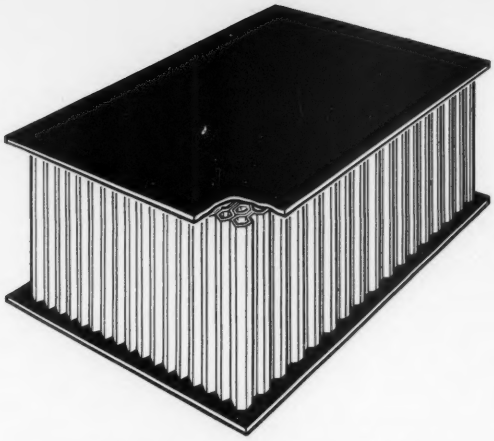
European aircraft manufacturers use metal-to-metal bonding adhesives extensively for attaching skin, marking spars, webs and other heavy members economically.

New elastomeric thermosetting adhesive films are used in bonding the complete aluminum assembly of helicopter rotor blades and are also used in bonding the trailing edges of aircraft wings. These adhesive films are also used in bonding aluminum to aluminum and the assembly of other metal-to-metal parts as primary and secondary structural components of aircraft and missiles.

Phenolic elastomer film adhesives are also used for structurally sealing integral aircraft fuel tanks and other closed systems. When the new Convair 880 jet transport goes into airline service almost all of the space inside its wings will be carrying fuel. Plastic adhesive material sandwiched between the joints makes fuel space out of practically every cubic inch in the inner spar box. A phenolic film is put in the joints between the skins to lock the seams and form leakproof, corrosion-resistant fuel tanks in each wing.

Guided missiles, too

Phenolic-elastomeric, vinyl - phenolics and epoxy resin adhesives are used to seal and bond guided



Honeycomb sandwich has metal facings bonded by adhesives to metal or reinforced plastic honeycomb core.

missile components . . . skin to stiffeners and fins, for example . . . wherever high bond strength in the 300 to 500 F range is needed.

As rapidly as designs and tests can be completed, more aircraft structures and components will be joined and assembled with adhesives. As service history is accumulated, engineers are becoming more confident of adhesive-bonded structures.

An oil-resistant phenolic elastomeric adhesive provides a fast, easy method of joining anodized plates in film holders. The adhesive is sprayed on flat aluminum septum plates. The plates are then bonded to an aluminum core. The joining of the septums to the core was originally tried by spot welding, but this method caused poor appearance and the aluminum was somewhat difficult to spot weld.

Another manufacturer uses an oil-resistant high-strength adhesive in the manufacture of automatic transmissions for motor buses. A carbon steel ring is joined by adhesive bonding to the machine surface of the torque convertor housing. The adhesive also acts as a sealer against torque convertor oil pressure. Operating temperatures of the oil ranges from between 180 to 220 F.

In the refrigeration industry, high-strength epoxy resin adhesives and phenolic modified elastomers are used to bond cooling coils to evaporators of home freezers. These adhesives are also used for bonding coils or tubing to fins of radiators used for dissipating heat.

The horizon is limitless for the application of structural adhesives. The imagination of the design engineer is the only limiting factor.

Available in many forms

Structural adhesives are available as one-part heat curing liquids, as two-part room temperature curing adhesives, or as adhesive films of uniform thickness and weight that cure with heat and pressure. With this variety of physical forms available, a structural adhesive system can be found that will meet nearly all production and performance requirements, and the design engineer is provided with a high-strength joining method possessing many advantages.

After considering proper joint design and selecting the best structural adhesive for the performance required, it is necessary to consider the means of effecting a bond in order to achieve maximum performance.

The three major factors in obtaining a proper adhesive bond with structural adhesives are: surface preparation, adhesive application, and the bonding cycle.

For maximum performance and permanent bonds, all bonding surfaces must be thoroughly clean before applying the adhesive. Surface contaminants may include such things as mould releases on the surface of plastics, and paint, rust or other oxide films, oil and dust on the surface of metals.

Cleaning is important

There are many cleaning systems available for all types of surfaces. Basically, they fall into these categories:

1. Chemical cleaning. Preferred where high performance is required and rate of production warrants installation of proper equipment. There are a variety of chemical cleaning procedures for use with metals that will give satisfactory results. The following is a typical method for cleaning aluminum.

   Immerse for 10 minutes at 150 to 160 deg F in a solution of:— 30 parts of distilled water (by weight) 10 parts of concentrated sulphuric acid (by weight) 1 to 4 parts sodium dichromate (by weight)

   Note:—first dissolve sodium dichromate in water. Then add sulphuric acid slowly while agitating the solution.

   Important:—This cleaner is unsuitable for alloys containing iron. Here it is necessary to use an alkaline solution such as Oakite 164. Ten to twelve ounces per gallon of water is recommended at 190± 10 F for ten to twenty minutes and then *immediately* rinse with large volumes of water.

   Water rinse thoroughly and force dry at temperature below 160 F.
2. Sand blasting or abrading. Simpler method than chemical cleaning. Metal parts to be sand blasted must be of sufficient thickness to prevent distortion.
3. Vapour degreasing or solvent wiping. May be used where maximum adhesive strength or outdoor weathering is not required. To use these, cleaning methods surfaces must be free of rust, paint or scale. When solvent wiping, apply solvent with suitable applicator or cloth and then rub dry with a clean cloth. *Change cloth frequently.*

Once cleaned, adhesive should be applied without delay. Primer, applied directly after cleaning, will allow parts to be bonded up to thirty days.

The actual method of applying the adhesive is determined by the form of the particular adhesive used. Generally accepted methods of application are by spray, flow gun or brush for liquid or semi-liquid products, and "tacking" (using heat guns or soldering irons) for adhesive films.

Adhesive primers (thin viscosity modifications of the main adhesive) can be applied to freshly cleaned metal surfaces to prevent recontamination during storage or production delays. These primers do not interfere with the ultimate performance of the structural

adhesive bonds and in some cases may impart desirable properties to the finished bond. If cleaned parts are to be bonded immediately after cleaning, a primer is not necessary.

Whenever a primer or a solvent-containing adhesive is used, all of the solvent must be driven out of the adhesive film before completing the bond. If any solvent remains in the film, a porous bond may result or blowing out of the adhesive.

Correct temperature must be maintained

Regardless of the type of heating equipment used for fabricating with structural adhesives, it is necessary that the heat available at the bond line be sufficient to produce the desired cure in the adhesive. There are several methods of obtaining the required heat.

Circulating hot air ovens transfer heat to the assembled part by convection. Heat source for these heat exchange type ovens may be gas, oil, electricity, or steam. Transfer of heat to the bonded part and thence to the bond line is relatively slow and is affected by the type and thickness of the assemblies, as well as the mass of the fixtures used to hold the parts together under pressure. Circulating hot air ovens become practical for curing structural adhesives only when a large number of bonded assemblies can be placed in the oven at one time. Infra-red ovens can also be used.

Steam or oil heated platens can be used in flat bed presses. Steam is also the heat source in autoclaves. Heated platens have rapid and well controlled temperature rise which is well suited to adhesive curing procedures. Where the bond must be cooled before the pressure is released, platens can be water cooled with a simple valve arrangement. Very little time is needed for the platens to reheat for the next assembly.

Heating by electrical resistance is adaptable to platen presses and special fixtures. In most cases these presses and fixtures are maintained at contant temperature because of the relatively long warm-up time. This type of heating can also be used in the form of strip heaters or cartridge heaters and adapted for special shaped dies, flat dies, pressure bars, or other pressure fixtures. When fitted with thermostatic controls, accurate heat control is possible.

Dielectric heating is an extremely fast method of curing a structural adhesive but is limited in use. The faces of the bonding jig are the electrodes between which the dielectric field is established. The heat results from the high energy dielectric field passing through a nonconductor. Very thin adhesive films and possible voids in the adhesive or unbalanced electrodes will allow arc-through which breaks down the field. Consequently at least one of the materials being bonded must be a good non-conductor. Examples are bonding fibre glass reinforced plastics to metal.

The induction heating source is suitable for heating metallic conductors. It is now used extensively for brazing, soldering, heat treating and even melting metals. Utilization for curing adhesives is possible but not yet well investigated.

Constant pressure is needed

Constant pressure during heat curing is necessary because adhesives soften and tend to flow within the joint to a light degree. Thermal expansion of the bonding fixture and parts also takes place. Therefore, a pressure compensation system must be used to insure constant and uniform pressure over the entire bonded assembly. Several methods are available for accomplishing this objective.

Clamping fixtures such as "C" clamps, bolted fixtures, and lever arm types usually involve relatively low capital investment. The number of fixtures required depends on the production rate and the number of parts that can be assembled in each. Small and complex parts which are machined flat for good contact and are heavy enough to distribute loads can be used in these clamping devices. Springs should be incorporated in the clamp design to follow-up and compensate for pressure loss due to thermal expansion and adhesive flow-out.

Pressure cylinders can be used in specially designed jigs. Platen or matched dies can be actuated directly by simple attachment of cylinders. A series of cylinders operating a pressure bar can be used to apply pressure to long narrow bonding areas. The cylinders should be restricted between cross members and the assembly bed. By using reversible cylinders, the pressure bar can be raised or lowered, thus facilitating assembly and removal of bonded parts. Instantaneous heat and pressure can be accomplished if the pressure bar is also the source of heat. Metal strip heaters are commercially available for attachment to the face of the bar.

Using the bed as a heat source is feasible, but provisions must be made to rapidly assemble the parts and apply pressure before the adhesive line has reached reaction temperature.

Pressure pads and tubes consist of an inflatable tube or bag placed over the bond assembly and restricted between two rigid surfaces. This method provides excellent conformation to irregular configurations, and pressure distribution and follow-up are excellent. There is some inconvenience with this system as the pad must be placed on the assembly, inflated for bonding, then deflated and removed.

Vacuum equipment is an inexpensive method of applying pressure during the bonding operation. Assembled components to be bonded are enclosed in a rubber blanket and a vacuum is drawn. A cure is accomplished by placing the assembly in an oven. Vacuum techniques can be used with a heated platen to provide both heat and pressure simultaneously. The technique is suitable for large area bonds such as bonding corrugated sheet metal to thin gage sheet metal in stiffener applications.

This type of equipment, in the form of autoclaves, is widely used for aircraft structural bonding operations. Capital equpment investment is relatively high but advantages are many when large assemblies with many components are to be bonded. Parts to be bonded are first placed on a lay-up table and covered with a rubber blanket to provide uniform pressure distribution. The table is then placed in the autoclave. Air pressure is introduced into the autoclave and the table and parts are brought to temperature at the desired rate by heated platen.

This article concludes the three part series on structural adhesives. We have attempted to present an overall reference on structural adhesives; their advantages, typical uses, properties, design concepts, joint designs and bonding methods.

The advantages of this new assembly concept should be investigated wherever a holding or assembly application is to be accomplished with conventional fastening or fusion methods. Many industries have already realized the advantages of structural adhesives to solve design problems and reduce part assembly costs. You may be able to do the same.

DE previews . . .

the 1961 Design Engineering Show

Cobo Hall, scene of this year's Design Show . . . with Detroit skyline in the background

The newest in materials and components . . . for engineers and executives

Canadian design engineers are taking a special interest in the 1961 Design Show to be held in Detroit. It's an easy jaunt from Toronto and the big industrial belt to Detroit . . . the first time a big international design show has ever been held so close to home.

Because of this, a record Canadian attendance is expected. They will help swell the total attendance, which should exceed 18,000.

Engineers and manufacturers seeking ideas for new products or new models of old products will have some 15,000 ideas presented to them at the show. More than 440 companies will be exhibiting the most recent results produced by the world's leading research and development laboratories. The exhibits will cover seven acres and will be valued at more than ten million dollars.

Because it covers new developments in all fields, and because the current economic situation has heightened the search for new products and ideas, the show is expected to have unusual significance for the higher echelon businessmen this year.

More than 100 companies will show new types of materials. All sorts of mechanical, electrical and electronics components will be displayed, as well as power-transmission equipment, fasteners and adhesives, finishes and coatings, shapes and forms and various kinds of engineering accessory equipment and services.

Canada will again be represented by a major exhibit at the show. Last year the Canadian exhibit was one of the main attractions. Sixteen companies, as well as the government, will be making an appeal to U.S. industry for more orders for Canadian equipment and supplies.

As in the past, the machine design division of the American Society of Mechanical Engineers will conduct a four-day conference, to run concurrently with the show, on the subject of design engineering. Officials of Ford, Chrysler, General Motors and American Motors will address the opening session on "Designing for Today's Competitive Market." Companies which will send other engineers and officials to lead the discussions include General Electric, Corning Glass, Allegheny Ludlum Steel, Budd, Westinghouse, Du Pont, Minnesota Mining & Manufacturing, Monsanto and Socony, plus many others.

Although considerable discussion will revolve around the development of new products, other sessions will centre on designing products to reduce production costs through use of automatic machinery.

Admission is to qualified persons only . . . that is, those working in the management, engineering and design fields. Use the pre-registration card bound in this copy of Design Engineering. And be sure to look for us around the Canadian exhibit.

Check these facts . . .

The Show

Place:	Cobo Hall, Detroit
Dates:	May 22-25, 1961
Hours:	12 noon to 5.30 p.m. daily Monday through Thursday
Registration:	$2 payable at the registration desk. Use the rapid registration form provided in this issue.

The Conference

	Sponsored by the Machine Design Division, American Society of Mechanical Engineers
Place:	Cobo Hall, Detroit
Dates:	May 22-25, 1961
Registration:	$5 for ASME members $10 for nonmembers Includes copy of Conference Proceedings

. . . then read these details

ASME Design Conference program 52
Here's how Canadians will participate 56
Swing-tail design leads the world 59
New products at the Design Show 60

1961 ASME Design Conference . . .

Monday, May 22

10.00 a.m. **DESIGNING FOR TODAY'S COMPETITIVE MARKET**

Engineers today must design to meet increasingly stiff domestic and overseas competition, and nowhere is competition keener than in the high production automotive industry. A panel of top-flight automotive executives will discuss their department roles in designing a superior product to meet this continuing competition. They will highlight the interplay of production, purchasing and engineering by prepared discussion and answers to questions from conference participants.

How a Car is Planned and Engineered with Marketing, Purchasing, Manufacturing, and Quality Control Considerations
WILL SCOTT, Executive Director of Central Product Planning Office, Ford Motor Car Co., Dearborn, Michigan.

Designing for Function and Cost Objectives
HERBERT M. BEVANS, Executive Engineer, Chassis, Electrical, Truck Section, Engineering Division, Chrysler Corp., Detroit, Michigan.

Production Engineering as it Affects Car Design and Sales
CONRAD F. ORLOFF, Assistant Chief Engineer, Production Engineering Department, Chevrolet Motors Division, General Motors Corporation, Detroit, Michigan.

Role of the Supplier in Meeting Competition
CARL E. BURKE, Chief Development Engineer, American Motors Corp., Detroit, Michigan.

Tuesday, May 23

9.30 a.m. **MANUFACTURING — KEY TO SAVING**

Two key considerations that can reduce manufacturing costs are: producibility of a product and material standardization. What significant manufacturing techniques make a product "producible" and what savings can be derived from a material standardization program will be discussed.

61-MD-1: **Producibility—Designing for Production**
C. EDWARD WARNER, Manager—Advanced Manufacturing Engineering Service, General Electric Co., Schenectady, N.Y., and ROBERT L. BERG, Consultant—Producibility Engineering, General Electric Company, Schenectady, N.Y.

61-MD-2: **Material Standardization to Reduce Costs**
GERALD L. SWARTWOOD, Material Engineer and Drafting Supervisor, The Bryant Electric Company, Bridgeport, Conn.

9.30 a.m. **AUTOMOTIVE EQUIPMENT — SPEEDS PRODUCTION**

Modern machines use hydraulic power and special drives formerly thought impractical. Here's a pair of papers that outline the analysis of system dynamics and the matching of components to give high speed, high production, automated equipment.

61-MD-3: **Special Requirements of Hydraulic Circuits for Servo Controlled Machinery**
ROBERT K. SEDGWICK, Assistant Chief Engineer, Servo Division, Kearney and Trecker Corp., Milwaukee, Wisconsin.

61-MD-4: **Drives for Tape-controlled Machine Tools**
GEORGE W. YOUNKIN, Chief Development Engineer, Giddings & Lewis Machine Tool Co., Fond du Lac, Wisconsin.

9.30 a.m. **GLASS AND CERAMICS — NEW DESIGN POSSIBILITIES**

61-MD-5: **Ceramic Materials: A Chemical and Structural Description**
DR. MARVIN G. BRITTON, Technical Manager, Government Services Department, Corning Glass Works, Corning, N.Y.

61-MD-6: **What do Glasses and Ceramics Offer the Design Engineer**
JOHN R. BLIZARD, Manager, Product Engineering Department, Technical Products Division, Corning Glass Works, Corning, N.Y.

9.30 a.m. **HIGH STRENGTH STEEL — RECENT DEVELOPMENTS**

61-MD-7: **High Strength Steels—Materials**
R. A. LULA, Chief Research Metallurgist, Stainless Steel, Allegheny Ludlum Steel Co., Pittsburgh, Penn.

61-MD-8: **High Strength Steels—Design and Fabrication**
RICHARD H. MARVIN, Chief Engineer, Space Atomic Section, Product Development Department, The Budd Co., Philadelphia, Penna.

PAGES 53-54 MISSING READER'S SERVICE CARD.

. . . May 22 to 25 Cobo Hall, Detroit

Wednesday, May 24

9.30 a.m. **MOTORS — ECONOMICS AND APPLICATIONS**

An original equipment item that can offer real economies through weight and size reductions by being able to operate at higher temperatures. Many new applications are offered in the companion paper on synchronous units.

61-MD-9: **Electric Motors of Higher Temperatures for Industrial Usage**
FRANK C. RUSHING, Engineering Manager, Motor and Gearing Department, Westinghouse Electric Corp., Buffalo, N.Y.

61-MD-10: **Mechanical Application of Non-excited Synchronous Motors**
J. P. LANDIS, Development Project Engineer, Electro-mechanical Development Section, Mechanical Development Laboratory, E. I. duPont de Nemours & Co., Wilmington, Delaware.

9.30 a.m. **PRODUCTION — COST SAVING HINTS**

Numerically controlled machines require special part design to give the greatest saving. At the same time, close tolerances and finishes add cost even though automatic machines can do the job. Charts permit optimum selection of all factors to reduce product cost.

61-MD-11: **Design Considerations and Drafting Techniques**
ALEXANDER TALEFF, Equipment Development Engineer, Headquarters Manufacturing Laboratory, Westinghouse Electric Corp., Pittsburgh, Penna.

61-MD-12: **Cost and Value of Small Tolerances and Smooth Finishes**
DR. W. W. GILBERT, Manager, Machining Development Service, Manufacturing Engineering Services, General Electric Co., Schenectady, N.Y.

9.30 a.m. **ADHESIVES — FOR METAL BONDING**

Adhesives are one of the newest methods of bonding metals, with bonded engine parts under test. Factors which must be known for most design problems are given. Discussed also are the differences between bonding metal parts and non-organic materials.

61-MD-13: **Adhesives: Types and Characteristics**
W. C. O'LEARY, Technical Director, Adhesives, Coatings and Sealers Division, Minnesota Mining and Manufacturing Co., St. Paul, Minn.

61-MD-14: **Factors in Joint Design Using Adhesives for Metal Bonding**
KENNETH F. CHARTER, Director, Plastics Research and HARRY B. BUTZLAFF, Supervisor, Plastics Research, A. O. Smith Corp., Milwaukee, Wisc.

9.30 a.m. **COST ANALYSIS — FASTENERS AND POWDER PARTS**

61-MD-15: **Which Fastener Should We Use?**
JOHN W. STOUTENBURG, Vice-president, Robins Products Co., Warren, Mich., and KENNETH W. RINGLAND, Chief Engineer, Central Screw Co., Keene, N.H.

61-MD-16: **Designing with Powder Metallurgy to Improve Quality and Reduce Cost**
PAUL J. FAILLA, General Superintendent, Machine Shops, Johnson Bronze Co., New Castle, Penna.

Thursday, May 25

9.30 a.m. **PLASTICS — UNUSUAL BEHAVIOR**

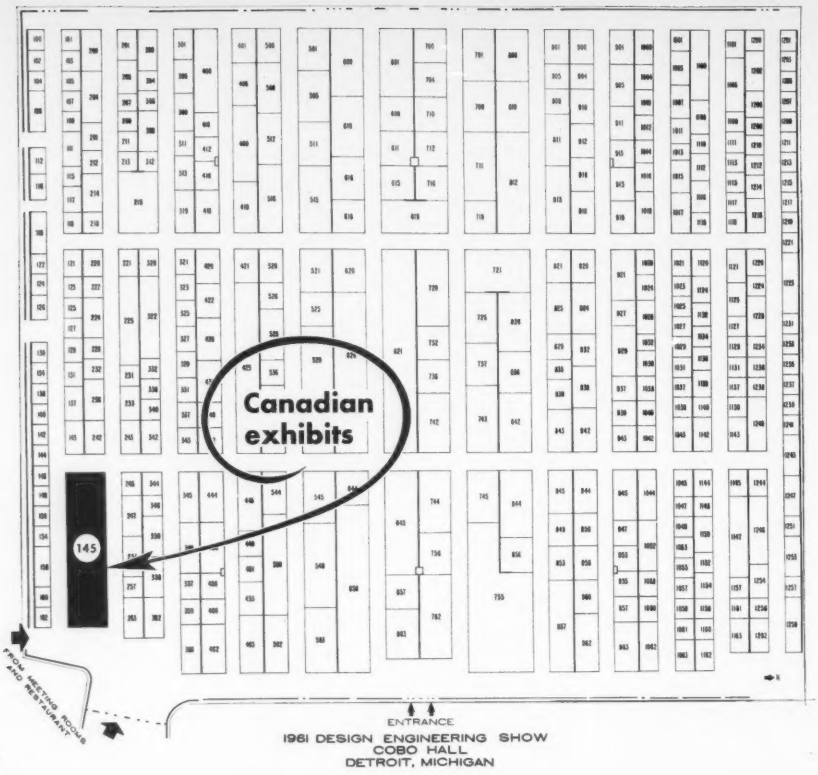
61-MD-17: **Filament Wound Pressure Vessels**
RICHARD GORCEY, Group Leader, Solid Propulsion Structural Components, North American Aviation Inc., Canoga Park, Calif.

61-MD-18: **An Introduction to Designing with Plastics**
R. L. THORKILDSEN, Mechanical Behavior Engineer, General Engineering Lab, General Electric Co., Schenectady, N.Y., and DR. JOHN V. SCHMITZ, Manager—Chemical Research, Major Appliance Chemistry Laboratory, General Electric Co., Louisville, Ky.

9.30 a.m. **DYNAMICS — DAMPING AND GEARS**

61-MD-19: **Visco-elastic Damping**
D. KENT HATCH, Engineer, Product Engineering Group, Plastics Division, Engineering Department and C. HOWARD ADAMS, Manager, Product Engineering, Monsanto Chemical Co., Springfield, Mass.

61-MD-20: **Effect of Misalignment on Tooth Action of Bevel and Hypoid Gears**
MERIWETHER L. BAXTER, Chief Research Engineer, Gleason Works, Rochester, N.Y.



Here's how Canadians will participate

1961 Design Engineering Show attracts sixteen companies featuring everything from special machinery to miniaturized components—designed and made in Canada

Participation in the Design Engineering Show is becoming more and more of a habit with Canadian industry. Over one half of those scheduled to display their products in the show this year are repeat performers . . . and a number of them have been in the show every year since Canada first took part.

Organized by the Department of Trade and Commerce, whose theme this year has been to increase the country's exports, Canadians will occupy a unique and commanding position. As the floor plan above illustrates, the Canadian booth will be situated at the entrance to the great new exhibition area in Cobo Hall, Detroit. It has been said that "first impressions are lasting impressions", and the Canadian officials who chose the location are hoping this will be the case indeed.

Canadian export of "engineered" products is on the increase. One of the best ways to maintain that trend is to participate in shows such as the Design Engineering Show. Last year hundreds of trade enquiries were recorded, and some of the companies involved required months to catch up on the orders that were initiated at the show.

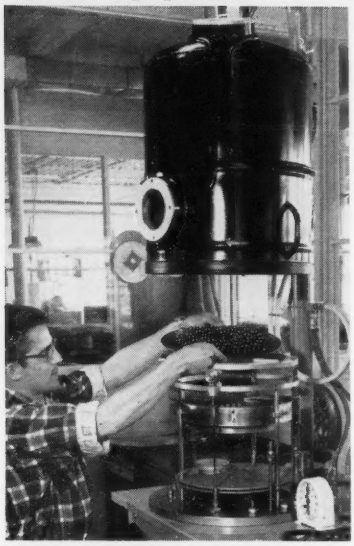
The products to be displayed under the Canadian banner will be only slightly indicative of the great range of products which have been designed and manufactured in this country. Some of the items have been held over from last year, so they cannot be said to be really new. In other booths, there will be duplication or similarity of products.

Last year at the show in New York, one of the feature attractions of the whole presentation related to the Canadian aircraft industry, in the form of a Pratt & Whitney engine. This year the aircraft industry will again be to the forefront . . . we suspect that the swing-tail CL-44 models to be exhibited by Canadair (see page 59 for details) will steal most of the attention.

Some of the products which the Canadians will be displaying in Detroit are described in the next two pages. The list is by no means complete, but it is all that we have been able to obtain from the companies concerned.

Design Engineering suggests that every engineer in Canada should attend this show . . . simply use the special registration card enclosed with this issue.

Optical equipment



This scene is in a Canadian factory which produces top quality lenses, and the workman is operating a high-vacumm apparatus for applying an anti-reflex coating.

Many Canadians do not realize that high quality lenses are produced right within their own borders, but proof will be available at the Ernst Leitz Canada Limited exhibit. The company plans to show various new lenses for aerial photography, micro reproduction and projection. They will be so hot off the production line that they had still not been finished in time to have them photographed for publication in this issue.

Ernst Leitz was established in Midland, Ontario eight years ago. Today 150, including a development and design staff of ten, are employed at the 40,000 square feet plant. Apart from a regular photographic line, it sells to about 80 different countries and has several development and manufacturing contracts for government institutions and American organizations.

The company's chief designer, W. Mandler will be at the Design Show to answer questions on an unusual design aspect . . . optics.

Circle 304 on Reader Service Card

Canadian bearings

Made with Canadian material by Canadian labor. That is the feature of the line of bearings to be depicted by Fischer Bearings Manufacturing Limited.

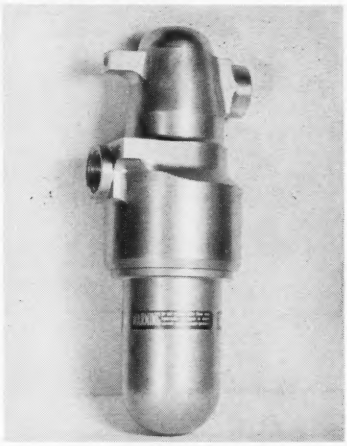
Canada's sole manufacturer of precision instrument bearings, Fischer is also a producer of aircraft engine bearings as well as a complete range of precision deep groove ball bearings for all types of industry. Its water pump shaft assemblies are supplied to the original equipment markets in both Canada and the United States.

Fischer was opened in Stratford, Ontario in 1954 as a direct subsidiary of Kugelfischer, George Schäfer & Company, Schweinfurt, West Germany. It now employs 260 personnel under General Manager O. Weth. A recent expansion program more than doubled the original floor area and provided a highly modernized production line for its automotive products.

The company's Detroit representative, F. J. Bush and the chief engineer R. E. Leeming will be in attendance at the Fischer display.

Circle 305 on Reader Service Card

Aircraft parts



A high-pressure filter, such as this, is one of the products to be displayed by Parmatic Engineering Limited, Canadian designers and producers of aircraft filters and pressure switches.

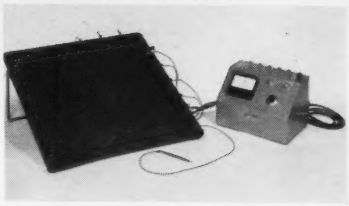
It is the company's policy to design filters specifically for aircraft applications, and not merely to adapt commercial design. As a result Parmatic has won recognition in both Canada and abroad. Today its products are helping to maintain in safe flight aircraft made in at least seven countries around the world.

The company's history dates from 1953, where in a small Mimico (Toronto) workshop, president John Parkinson and seven employees built a reputation that was later to attract bigger contracts, enabling a move to the present Owen Sound plant. The RCAF is one of its important customers.

Parmatic holds sole North American licensing rights for a British fire detector system and is agent for other British and American firms.

Circle 306 on Reader Service Card

Industrial controls

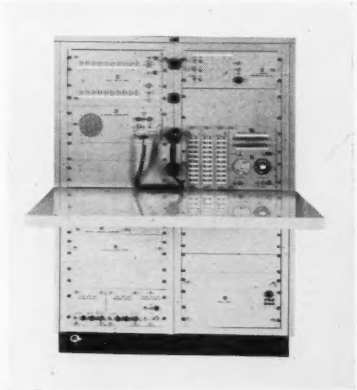


An electric field plotter, like the one above, will be displayed by George Kelk Limited, along with a shaft position coder. The plotter allows solution by rheo-electric analogy of problems involving the Laplace field equation such as those relating to heat and fluid flow, and electrostatic and magnetic fields. Conductive paper is placed on the plotting board and the physical configuration of the subject to be investigated is simulated by low resistance conductors painted on the paper.

An electronic and electromechanical engineering firm, George Kelk Limited designs and manufactures special devices and instrumentation for industrial control and measurements. It was established in 1953 when George F. Kelk left a position as chief development engineer to take the initiative in designing and manufacturing electronic test equipment for jet aircraft. Since then the firm has expanded its activities to embrace most branches of industry.

Circle 307 on Reader Service Card

Microwave system



This terminal supervisory console is part of the 600-channel microwave equipment to be displayed by RCA Victor Company Ltd. Part of an integrated group of units which go to make up a microwave relay system, the console will be shown together with the channel service equipment.

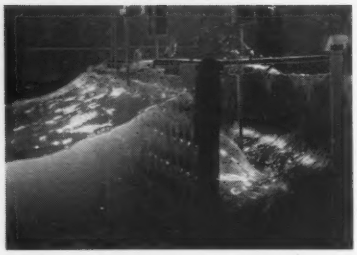
The system has an r-f channel capacity of 600 frequency division multiplexed voice circuits. Service channel signals used in maintaining the system

are transmitted in the same r-f channel as the message traffic, eliminating the need for a wire line or separate radio system. An important feature is the "failsafe" automatic interrogation system which constantly checks components and environments at each station every 6 seconds.

RCA Victor, a company with branches from coast to coat, has already installed several similar systems across Canada.

Circle 308 on Reader Service Card

Canadian inventions



The Canadian section of the Show will contain many examples of the novel ideas Canadian designers are adapting for practical use. And a number of them will be seen in the display of Canadian Patents and Developments Ltd., a company that makes available to manufacturers, through licensing agreements, the inventions resulting from publicly financed research and development work in Canada.

The picture above represents one of these inventions. It shows simulated 20 ft waves striking a breakwater made of a perforated front wall and a solid back wall. Designed to absorb the energy of impinging waves, its action prevents large standing waves and thus permits a much less massive structure than its equivalent conventional sea wall.

Other Canadian inventions to be displayed by Canadian Patents and Development are: precise surgical instruments for joining severed blood vessels with metal staples, a uni-axial pantograph, a retaining ring made of non-spring material and zirconium bearings.

Circle 309 on Reader Service Card

Joints and connectors

Triodetic joints and connectors that eliminate the need for welds, bolts or rivets in structural connection are the featured product of F. Fentiman & Sons Ltd. Using only two elements — prismatic structural members (usually tubes) and connecting hubs — a connection with structural efficiency greater than 90% in tension can be achieved.

The hubs are produced by extrusion, casting or broaching. Slots in the hubs receive the ends of the structural members which are prepared for connection by a pressing operaton.

These connectors have a wide range of applications from small household installations to giant radar apparatus. The company claims they are stronger than rivetted or bolted construction, not subject to thermal stresses due to welding, and are easily assembled with semi-skilled or unskilled labor.

Fentiman holds patents for the design in Canada and the U.S. as well as in foreign countries.

Circle 310 on Reader Service Card

Landing gear

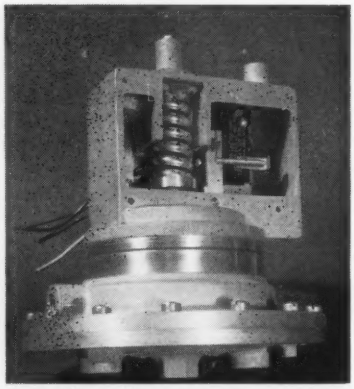
Hydraulic equipment and landing gear, designed for some of Canada's most modern locally-made aircraft, will be incorporated in a display by Dowty Equipment of Canada Limited.

The company intends showing the main and nose landing gear on the CF. 100 and the F.104. It will also show the hydraulic reservoir used in the Bomarc missile.

The story of Dowty's contribution to Canadian aeronautics goes back to 1940 when Sir George Dowty opened a plant in Montreal to expand his sales and service organization. By the end of the last world war the plant had produced more than 180,000 units and was the country's first-established truly-Canadian source of supply of aircraft accessory equipment for prime contractors. It was then that Dowty made the first step in the industry by setting up a specialized design and development facility.

Circle 311 on Reader Service Card

Pressure controls

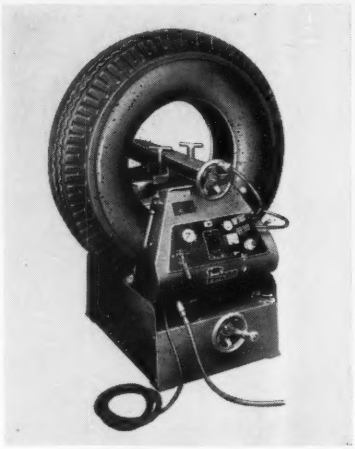


One of a line of pressure control switches to be displayed by Sirco Products Ltd., Canadian designers and manufacturers of controls and control systems. The company manufactures over 900 types of 22 basic models ranging from 28 inch mercury column vacuum to 15,000 psi with fixed and adjustable differential.

Founded in Vancouver four years ago as parent company with subsidia[illegible] Great Britain and the United States, Sirco Products holds patents for controls in 12 different countries. The company attributes its fast successful growth to its wide range of controls which feature immunity against over-pressure, fixed or continuously adjustable differential, and positive on-off action on all differentials.

Circle 312 on Reader Service Card

Vulcanizing equipment



This vulcanizing tire mold will be the feature of a display by Vulcan Equipment Company Ltd., Canadian manufacturers of retreading equipment. Considered one of the leaders in the field, the company now supplies vulcanizing equipment to many of the major users in the United States.

Founder of the company, E. J. Alm first saw the need for producing reasonably priced tire vulcanizers at his brother's shop in 1938, and had turned out the first conventional-type aluminum mold in his basement in 1941. Returning from Europe in 1952 he decided to prove his theory that 500 to 1,000 lb machines were not necessary for curing less than 1 lb of rubber. In 1956 the first low-cost mandrel-type mold was on the market. Vulcan's research department is still working on new ideas in tire vulcanizing equipment to add to its recent lines which include tire spreaders.

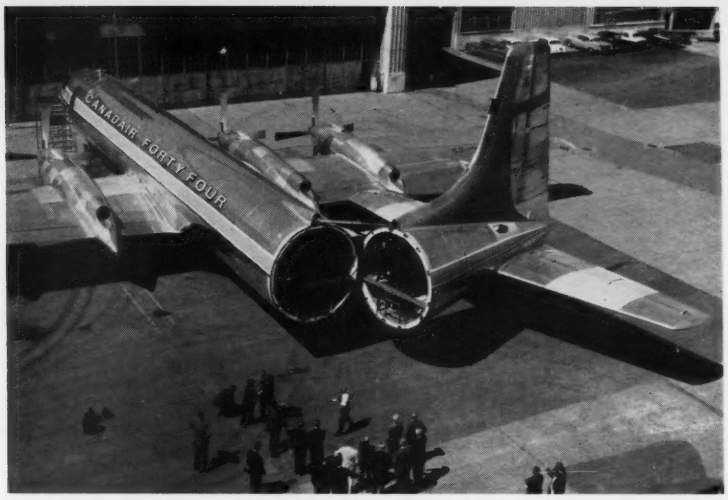
Circle 313 on Reader Service Card

Other Canadians

Others that will exhibit in the Canadian display at the Design Show are:

- Needco Cooling Semiconductors Ltd.
- Glosta Manufacturing Co.
- Fluid Power Ltd.
- Sharpe Instruments of Canada
- S.F. Bowser Co. Ltd.
- Neptune Canada Pumps

Canadian swing-tail design leads the world



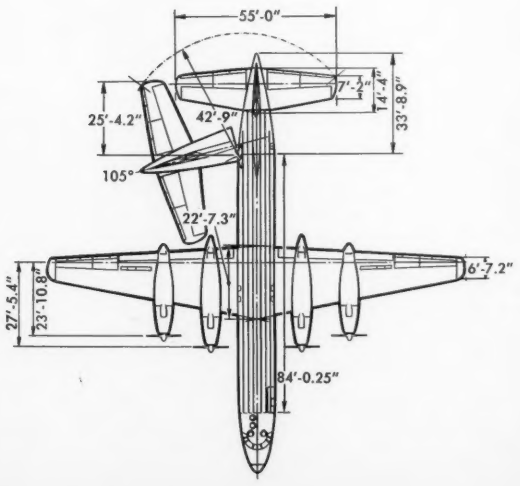
The Design Show exhibit of Canadair will feature the world's first long-range swing-tail aircraft, from the drawing boards of a Canadian design team

In the international arena of this year's Design Show, one Canadian display is sure to provide evidence of the important role Canadian designers can, and are playing in the development of the modern world.

The display: a profile of a revolutionary idea in aeronautical design . . . Canadair's CL 44 turbo-prop freighter with the swing-tail door. A big cutaway model, with photographs tailored to whet the appetite of design engineers, will help Canadair show the world her newest offspring, soon to ferry air cargo for leading U.S. all-freight airlines.

It was not until after the initial order of twelve "straight" forty-fours by the RCAF that Canadair went ahead with its plans for re-designing the fuselage to allow the tail to swing open. But it was this modification that prompted the commercial orders south of the border. The first swing-tail was attached to the fuselage of a CL 44 on the Montreal production line last June and the first new aircraft is now about due for delivery.

The yawning hole in the fuselage allows unobstructed access to the full cross section. With mechanical loading, ground turn-around is chopped from a usual five hours to about an hour, allowing unloading and reloading in the time taken for servicing and refuelling. It can carry a payload of 33 tons and has transatlantic capabilities. If ever necessary, the cabin can be converted to take 162 tourist-class passengers.



The fuselage is a conventional semi-monocoque structure of aluminium alloy sheet riveted to continuous longitudinal stringers and annular frames. The complete tail-end, carrying the horizontal and vertical aluminium alloy stabilizers, is hinged on the right-hand side and swings through an arc of 105 degrees.

Swing-tail operation is controlled from a panel inside the tail section.

Controls for the rudder, elevator and trim pass across the fuselage break-line. Sets of bevel gearboxes operate pushrods through bell-crank levers, converting rotary motion of control torque tubes into fore and aft movement across the break-line where it is converted back into rotary motion by a second set of gearboxes. The pushrod ends are set with linkage slightly compressed to eliminate backlash.

Hydraulic pressure and return lines for the swing-tail system and for the control surface locks are carried across the break by rotating swivel joints. Flexible harnesses and hoses are used for the electric power lines and pneumatic and fuel lines to the tail anti-icing heater.

Swing-tail safety features are:

- Locking actuators with internal locks which operate when actuators are extended. The locking pins also have ball locks automatically securing them in place.
- Manual quick-disconnect in the hydraulic supply line at the joint isolating the swing-tail installation.
- Warning to the pilots when any locks are unsecured and or the hydraulic line is disconnected.
- Special devices protecting all protuberances at the opening during loading.

The swing-tail is mounted on two hinges covered with streamlined glass-fibre fairings. During closing alignment between tail and rear fuselage is obtained by a ramp and roller system. Eight locks secure the tail section to the main fuselage. ★

New products at the Design Show

Thrust bearing

A new type of needle thrust bearing using a glass fiber-filled nylon retainer that reduces undesirable sliding friction inherent in all-steel-type bearings. Nylon claimed to give greater life, less retainer wear. **Kaydon Engineering Corp.**

Circle 314 on Reader Service Card

Vinyl-metal laminate

A new prefinished material, vinyl to metal laminate, that is available in various colors, prints, and textures of semi-rigid vinyl sheeting on basic materials of steel, aluminium, electrogalvanized and aluminiumized. **American Nickeloid Company.**

Circle 315 on Reader Service Card

Motion control package

Intermittent motion control package, comprising single revolution type clutch with related controls assembled for convenient installation. New series of units will have capacities up to 250 ft. lb. and operating speeds from 50 rpm to 300 rpm. **The Hilliard Corporation.**

Circle 317 on Reader Service Card

Worm gear reducers

A new line of fin and fan cooled single reduction worm gear reducers, available in more than 100 types and sizes. It is claimed they provide up to 80% greater load capacity in 25% less space. Ratios range from 5:1 through 60:1. **The Ohio Gear Company.**

Circle 316 on Reader Service Card

Retaining ring

A new retaining ring with high thrust and impact resistance. Claimed to provide shoulder sufficiently high to retain components with large corner radii or chamfers. **Waldes Kohinoor Inc.**

Circle 318 on Reader Service Card

Roller chain

A circular roller chain that's designed for transferring goods from one straight line conveyor, round a curve to another conveyor. It is available for turns from 45 to 320 degrees. **Acme Chain Corp.**

Circle 319 on Reader Service Card

Force gauge

A new push-pull force gauge for in-line measurement of tension and compression loads and capable of making both measurements form the same end or head. Specially designed for use in standard testers. **Hunter Spring Company.**

Circle 320 on Reader Service Card

New valve

A valve with an unusual squeeze action which automatically controls the flow of air, oil, chemicals or even grinding slurries without using poppets or spools. There are no metal to metal contacts and no metal to rubber seals. **Airmatic Valve Inc.**

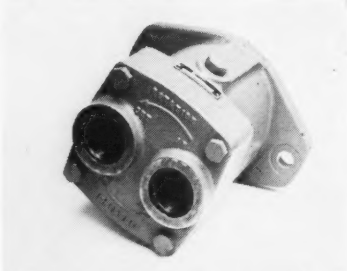
Circle 321 on Reader Service Card

Variable speed drives

New water cooled eddy-current variable speed drives which increased torque capacity as a result of better use of magnetic materials. Improvements have resulted in more compact, higher horsepowered units. **Eaton Manufacturing.**

Circle 322 on Reader Service Card

Piston pumps



A new line of in-line piston pumps designed for a wide range of high pressure applications requiring oil hydraulic power. They operate with minimum temperature rise and horsepower loss is considerably low. Handwheel servo and pressure compensator controls are available. **Vickers Incorporated.**

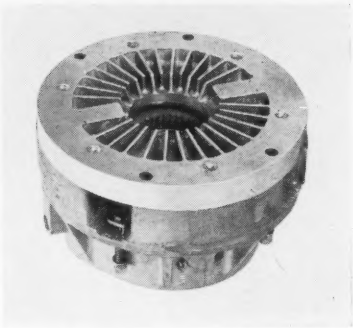
Circle 323 on Reader Service Card

Steel tubing

New sizes of electric resistance welded steel tubing available in round, square and rectangular shapes with heavier wall thicknesses. Sizes up to 7½ in. OD x .375 in. wall round, up to 6 in. x 6 in. x .259 in. wall square and up to 7½ in. major diameter x .259 in. wall rectangular. **Ohio Seamless Tube Division, Copperweld Steel Co.**

Circle 324 on Reader Service Card

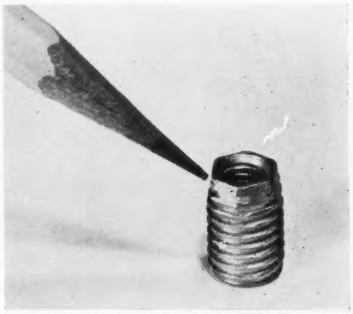
Clutches and brakes



A line of clutches and brakes claimed to have heat transfer rates up to ten times greater than some water-cooled units. Dual piston arrangement permits sensitive control with torque ratings from 5 to 50,000 in. lbs. **Fawick Corp.**

Circle 325 on Reader Service Card

Thread insert



A new thread forming insert which eliminates chipping during the tapping operation. Instead of cutting the thread the insert forms the thread by means of narrow lands. Angles are designed to cause the metal to flow around the insert as it is driven in. **Groov-pin Corp.**

Circle 326 on Reader Service Card

Splice cap

A pressure connector that makes wire twisting unnecessary. A stronger fluted cap confines the conductors to a tighter area while nylon insulator allows inspection. **Buchanan Electrical Products Corporation.**

Circle 327 on Reader Service Card

A new service for industry

Tired of government methods . . . will set up own trade fair participation

While the Canadian government, through its Department of Trade and Commerce, has been attempting to foster Canadian participation in foreign industrial and engineering shows, such as the Design Show featured in this issue, dissatisfaction has been expressed from a number of quarters that the effort has not been aggressive enough. Many firms that might otherwise participate are not even notified of the opportunity . . . the displays are too static . . . not enough information is available at the show itself . . . the Government hogs the best part of the display area for its own departments . . . these are some of the comments we have heard. Industry itself is taking steps to rectify this situation, by setting up its own organization. Here is that story, as told to DE.

The Canadian businessman will soon be able to participate in foreign international trade and industrial fairs without leaving his own desk. His products will be transported, displayed and promoted at the fairs in a "package deal" which will cost much less than would an individual exhibit.

Called INTERMART, the organization plans to buy space en bloc at the fairs and set up a co-operative travelling exhibit of Canadian products. INTERMART will staff the exhibits with multi-lingual representatives and assist in securing overseas sales agents.

Starting in the spring season, the exhibit would be moved throughout Europe to all major fairs. Up to 15 major fairs may ultimately be covered.

Heading up INTERMART is John G. Tames, Toronto advertising agency president. Mr. Tames states, "We have been studying the feasibility of this project for several months and find it highly practicable. A great many Canadian businessmen are becoming interested in exports these days, particularly to the booming European market."

Selling in Europe

In Europe, the most dynamic promotional medium is the trade fair — European businessmen are very 'trade-fair-conscious'. These fairs are their primary source of product information. Publications media, particularly trade and business papers, are far less developed in Europe than they are on this continent. Both at the trade and consumer level, participation in fairs is the most fundamental and imperative means of European merchandising.

A Canadian businessman wishing to sell the European market must therefore participate in these fairs. But an individual effort on his part can be impossibly complicated and expensive if he has had no previous experience. He or his representatives must spend weeks organizing and erecting the exhibit just for one fair and with all the inherent problems of language, customs and local laws.

Even if the exhibit is successfully arranged, the greater problems of international merchandising arise. To be of maximum value the exhibit must be designed and staffed to communicate with all interested prospects at the fair. Take the Milan Fair as an example — the largest in the world. This year there will be an estimated 14,000 exhibitors at Milan with more than a million samples of merchandise from 54 different countries. Buyers come from five continents. Representatives on the exhibit must be able to communicate in several languages on equal terms with experienced international traders.

A further very important consideration is that in a fair of this nature an exhibit of modest size such as most Canadians could afford is practically lost in such an enormous exhibition.

Size will be impressive

Because of the impressive size of the INTERMART exhibit achieved through a single joint effort, the Canadian products would occupy a dominant focal point at the fairs and far greater exposure per exhibitor would be obtained.

The INTERMART concept is first of all to remove the tremendous responsibility of an overseas exhibit from the shoulders of the Canadian businessman. Secondly, to reduce considerably the cost of such an exhibit through the co-operative display arrangement. In this manner, all Canadian manufacturers, however competitive in their own land, can co-operate and compete on an international scale.

The exhibit, which would travel as one unit from fair to fair throughout the season, would be staffed with multi-lingual INTERMART representatives. These men, all with European sales and merchandising background, would be thoroughly briefed on the products exhibited. Multi-lingual display material and promotional literature, will be produced.

Detailed contact reports would be made to exhibitors and a certain amount of sales liaison would be performed. However, follow-up would be largely the responsibility of the individual exhibitor.

Package deals are available

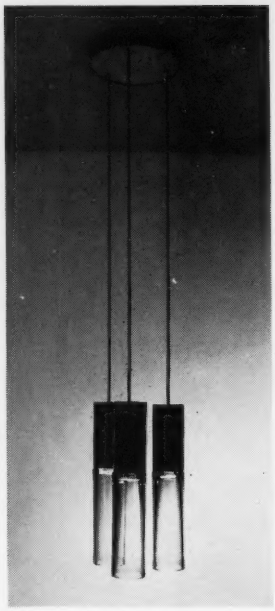
Exhibitors will pay for the INTERMART service on a straight per-square-foot rate based on the various rates of different fairs, plus a proportionate share of transportation costs. Exhibitors would actually buy a "package deal" covering a series of fairs.

Initial reaction of Canadian businessmen has been enthusiastic. INTERMART has already secured a number of clients and it is expected that the first exhibit will be on the move this year.

"We are shooting for the 1962 Spring Season," states Mr. Tames. "This means shipments of merchandise must leave Canadian seaway ports not later than the end of November." ★

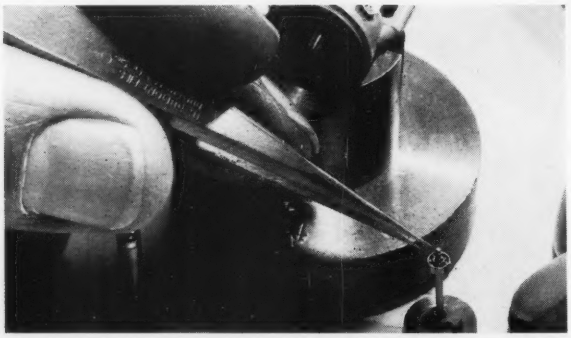
Designews

in pictures

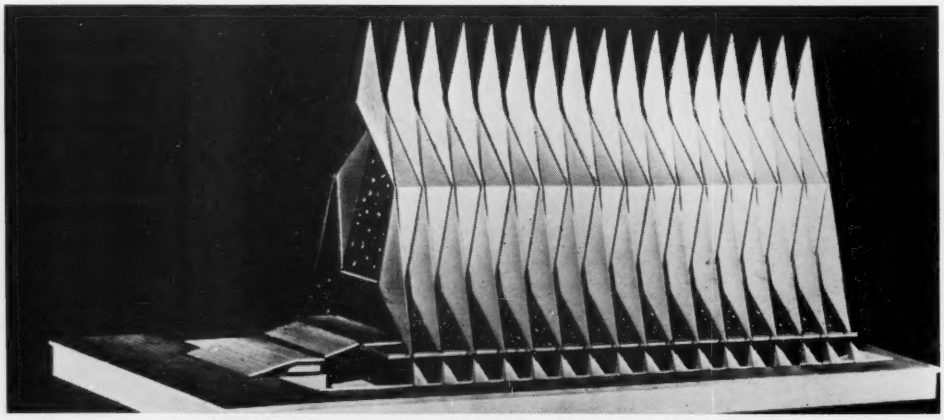


Two different types of lighting fixtures, but both were award winners of Britain's industrial Design Centre.

An eye-catching pattern and a functional transportation use for the landing pads.

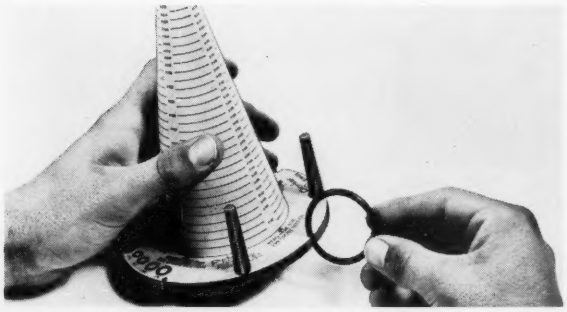


Tiny, precision bearings are mounted on the main shaft of a potentiometer to reduce friction and increase sensitivity.

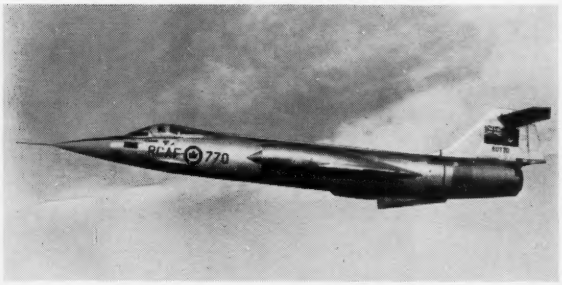


A seventeen spired chapel in Colorado was built from this weird looking model. Its steel pipe framework was designed to support heavy snow and withstand high velocity winds.

Another design award winner: New York International Airport, covering 4,900 acres, was chosen as the outstanding civil engineering achievement of 1961 by American Society of Civil Engineers.

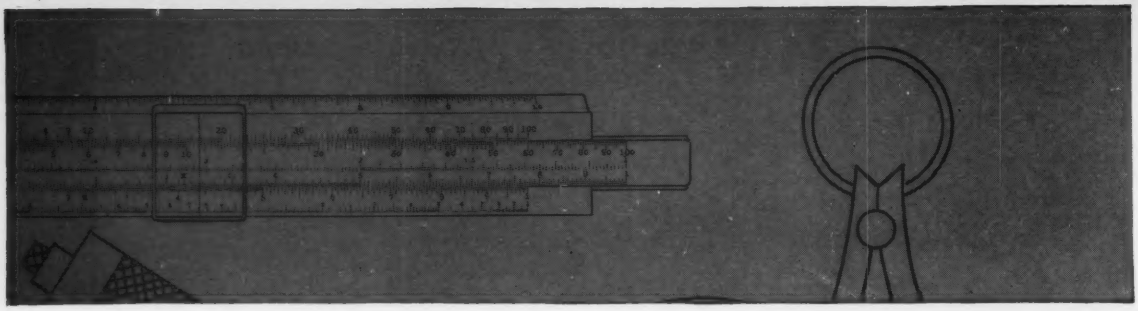


Here's a handy idea for checking I.D. and cross section of O-rings without manual or mechanical measuring.

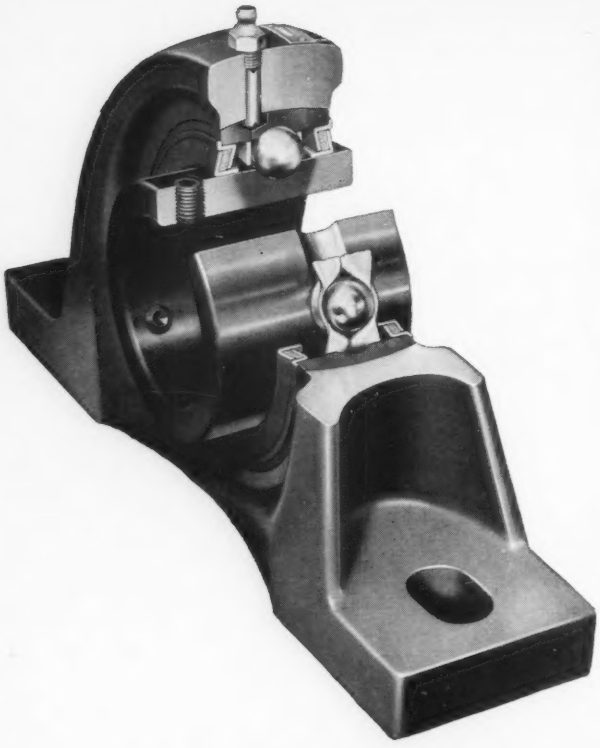


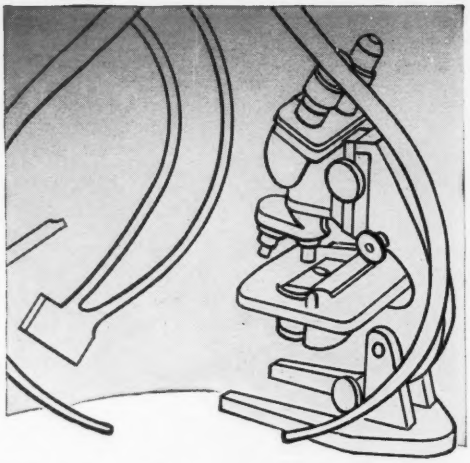
First in-flight of the prototype of Canada's aerial contribution to NATO—CF-104 Super Starfighter.

A model of the U. S. Courier satellite. Epoxy fibre glass shells are mounted on dummy structure to check the fit.



SYMBOLS OF PRECISION





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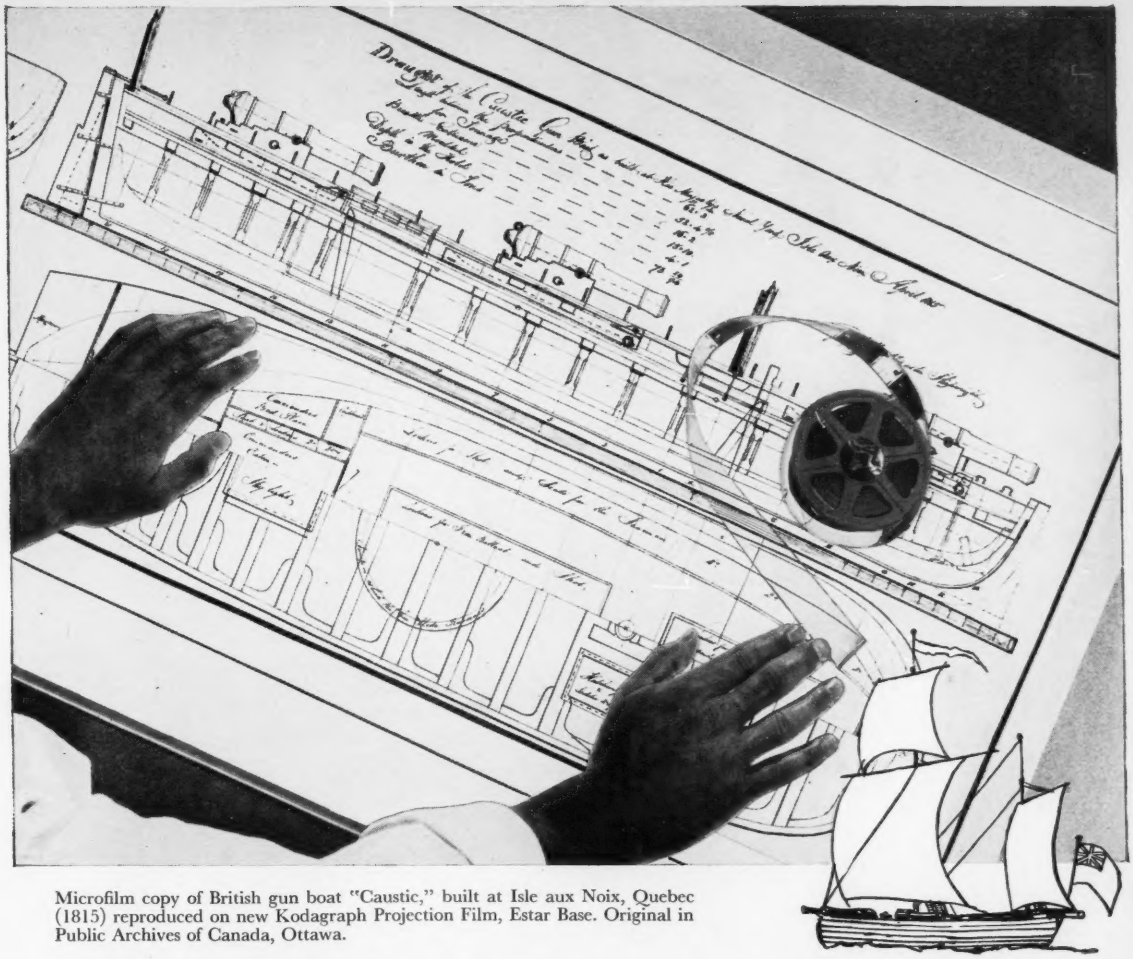

Microfilm copy of British gun boat "Caustic," built at Isle aux Noix, Quebec (1815) reproduced on new Kodagraph Projection Film, Estar Base. Original in Public Archives of Canada, Ottawa.

Ship-shape drawings–any size!

New Kodagraph Projection Film, Estar Base, produces change-in-scale intermediates that will stand up under the heaviest use in drafting room or print-room.

Blowups from microfilm or reductions of drawings and maps are remarkably sharp and clean on a whiter base that has a "built-in" longer life.

Production is easy. This new high-contrast, quick-processing film can be exposed in enlarger, projection printer, process camera . . . and handled with "1A" safelight. Wide latitude all but ends make-overs.

See this versatile new Kodagraph Film—and the others in the new *Estar Base line:* Kodagraph Contact Film; Kodagraph Autopositive Film.

All combine reliable Kodak emulsions on the new Estar Base—highly translucent, durable, and dimensionally stable, with excellent matte surface on both sides for easy drafting. Available in standard drawing sheet sizes and in rolls up to 52 inches wide. Call your local Kodagraph Dealer, or write Canadian Kodak Co., Limited, Toronto 15, Ontario.

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REPRODUCTION FILMS
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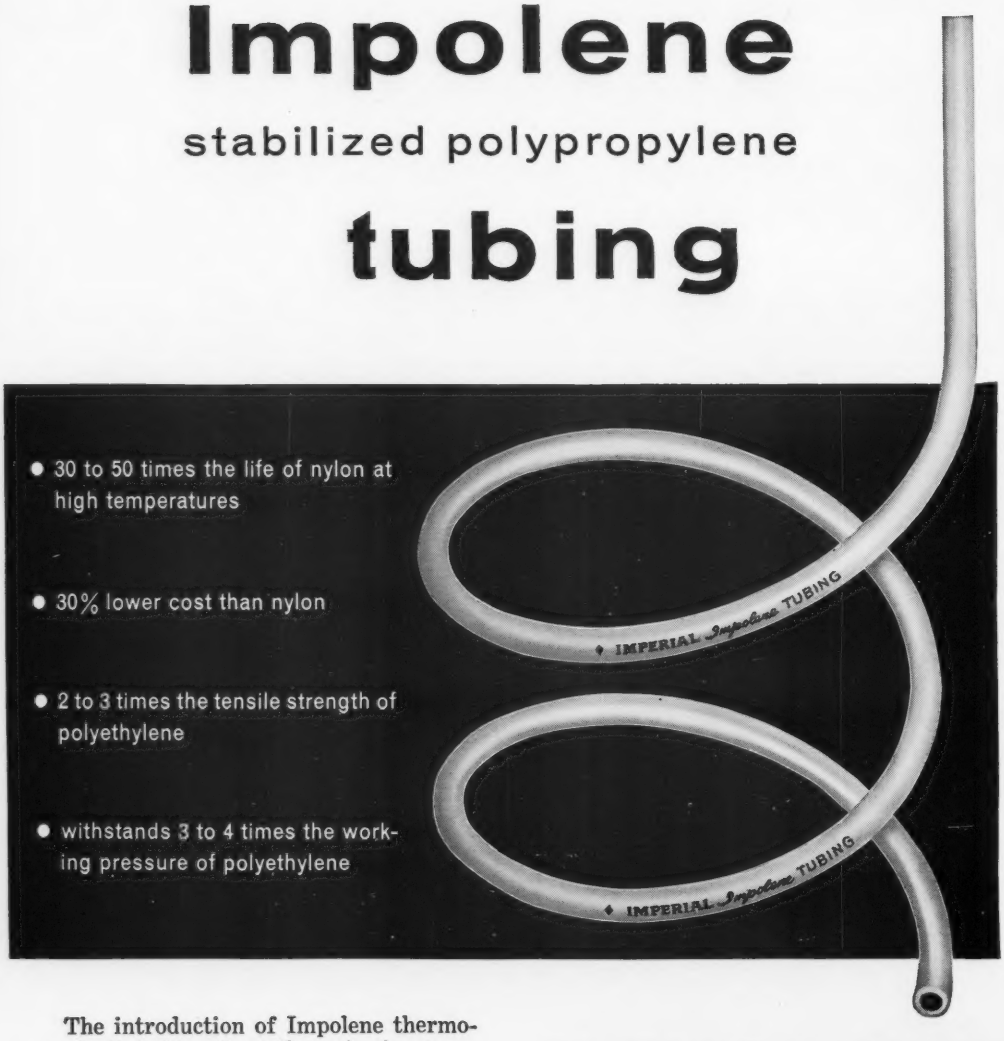
tubing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• withstands 3 to 4 times the working pressure of polyethylene
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High tensile strength. Highest strength-to-weight ratio of all thermoplastic tubing. Working pressures compare favorably with nylon—are 3 to 4 times greater than polyethylene.

Excellent corrosion-resistance. Resists concentrated hydrochloric acid up to the boiling point. Withstands saline solutions at temperatures over 212° F. Shows no detrimental effects in boiling sulfuric acid.

Wide temperature range. Can be used up to 300° F. Has 30 to 50 times the life of nylon at elevated temperatures. Remains flexible at —100° F.

Good abrasion-resistance. High surface hardness gives it much better abrasion-resistance than most thermoplastics.

Odorless . . . tasteless . . . resists sunlight. Approved by the FDA and NSF for food and drinking water applications.

Use Impolene tubing for air lines, control panels, instrumentation and lubrication systems, processing and construction machinery—many other uses.

Available in 500′ to 1000′ spools in O.D. from ⅛″ to ⅜″. Other sizes available on special order.

Poly-Flo Fittings—designed for use with all plastic tubing, yet usable with soft metal tubing. Withstand pressures beyond burst strength of tubing. Available in a complete range of sizes and styles.

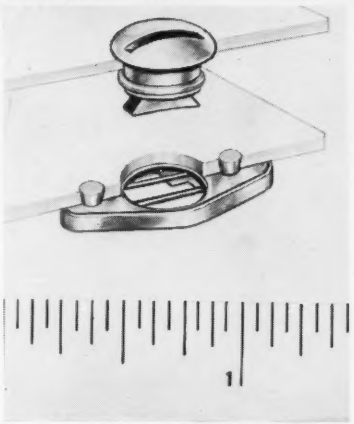
Now Imperial-Eastman meets all your requirements for hydraulic-pneumatic-flow system components: tube fittings, valves, couplings, flexible and rigid hydraulic and pneumatic lines, thermoplastic tubing, tubing tools.

TUBING

IMPERIAL — EASTMAN

New products at the Design Show—*continued*

Miniature lock



A new miniature quick-operating fastener designed especially for miniaturized electronics applications where space and weight limitations are important. Minimum inside projection is less than one-eighth inch. Locks and unlocks with ¼ turn. **Simmons Fastener Corp.**

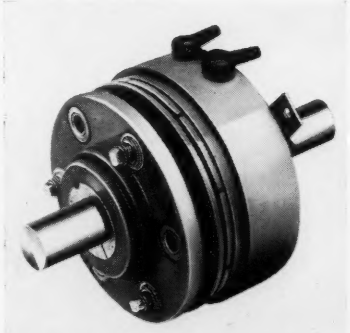
Circle 328 on Reader Service Card

Filing system

A new controlled filing system for rolled equipment with varying tube dimensions to fit every size, type or activity of stored materials. Consisting of four, six and eight tube modules in 4 in., 2⅝ in. and 1⅞ in. diameters, the system features simple clip interlocking device to ensure safe, stable stacking. **Hamilton Manufacturing Company.**

Circle 329 on Reader Service Card

Field clutch



A new stationary field clutch, 5 inches in diameter, incorporating a ball-bearing mounted field and a torque rating of 50 lb. ft. claimed features are easier mounting, increased torque-for-size and elimination of need for slip rings and brushholder. **Warner Electric Brake & Clutch Company.**

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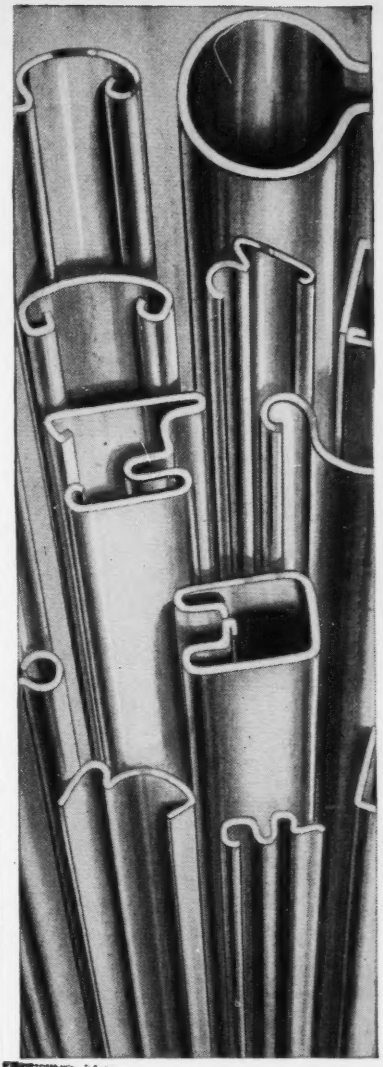

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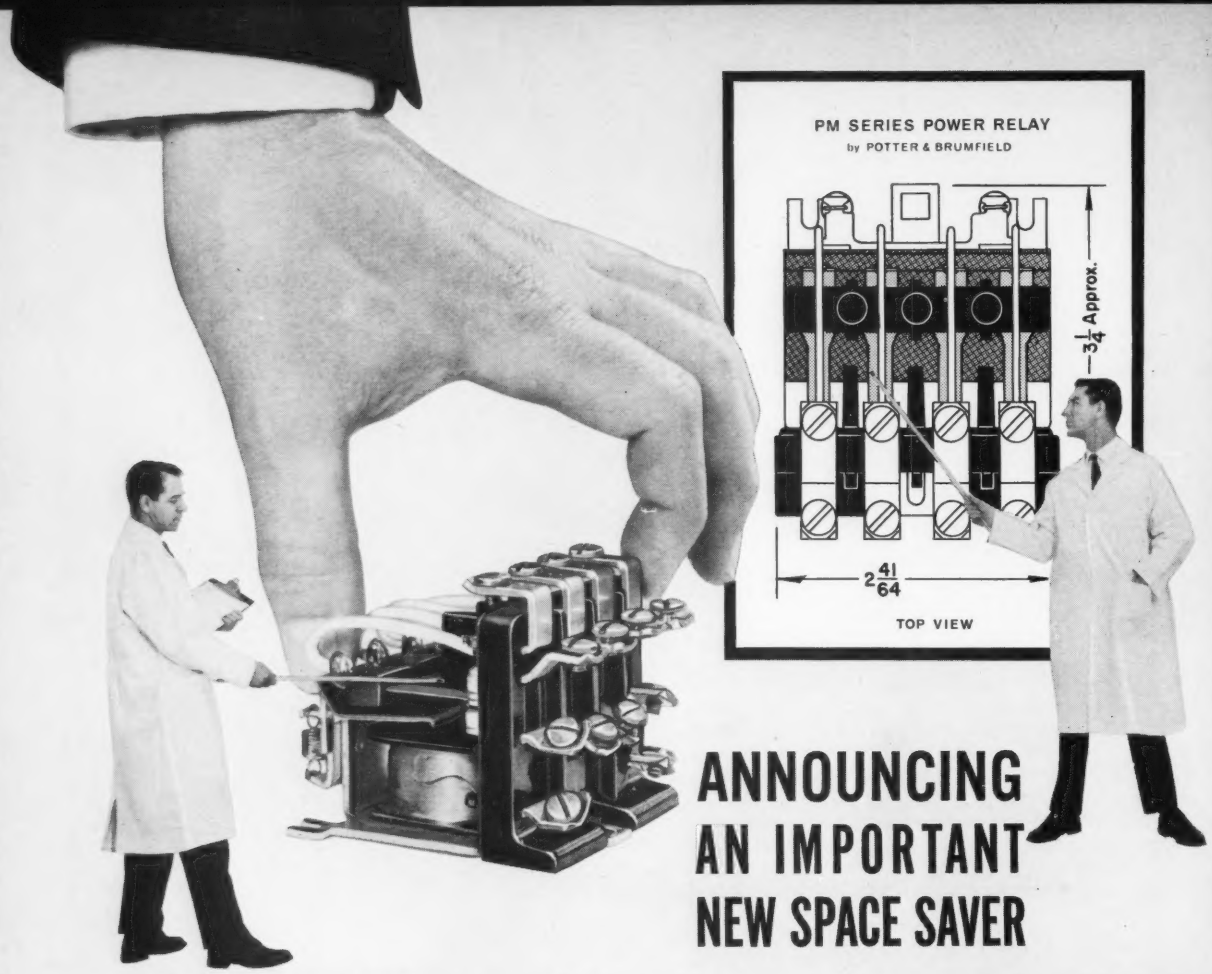

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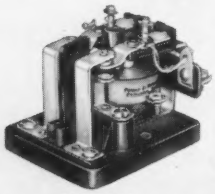
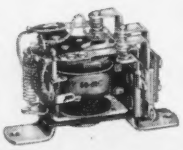
P&B compact 4PDT power relay switches one H.P. per moveable arm

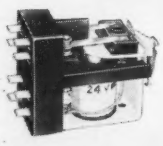
Save panel space! This new 4-pole relay is only 3/16" wider than our PR Series, America's most popular 2-pole power relay! Yet, it is engineered for reliable heavy-duty switching . . . and you can confidently expect 10 million mechanical operations.

PM Series relays are rated at 16 amperes (or 1 H.P.) at 115 volts, 50/60 cycles resistive . . . and special relays can be supplied for loads up to 25 amperes, at 220 volts, 50/60 cycles resistive. Heavy screw terminals are arranged for fast, easy hook up. An adapter plate is available for mounting PM relays in the same location used for 2-pole relays.

For full information, write today or call your nearest P&B representative.


PR Series


MR Series


AB Series

A whole family of power relays for a wide range of applications carry the P&B symbol of quality. Call P&B first for all your power relay requirements.

PM ENGINEERING DATA

GENERAL:

Description: Heavy-duty AC power relay.
Insulating Material: Molded phenolic.
Insulation Resistance: 100 megohms minimum.
Mechanical Life: 10 million operations minimum.
Contact Life: 100,000 operations minimum at rated load.
Breakdown Voltage: 2,000 volts rms minimum between all elements and ground.
Ambient Temperature: −55°C to +55°C.
Weight: Approximately 14 ozs.
Pull-In: 78% of nominal voltage.
Terminals: Heavy-duty screw type with No. 8-32 BH screw.

CONTACTS:

Arrangements: 4PDT or 4PST—normally open.
Material: ¼" dia. silver-cadmium-oxide.
Rating: 16 amps @ 115 volts, 50/60 cps resistive.
8 amps @ 220 volts, 50/60 cps resistive.
1 H.P. per moveable, 115 or 220 volts AC single phase.
25 amps @ 220 volts, 50/60 cps resistive available on special order.

COILS:

Voltage: 6 to 230 volts AC 50/60 cycles.
Power: 14 volt-amps average at nominal voltage.
Duty: Continuous.

P&B STANDARD RELAYS ARE AVAILABLE AT YOUR LOCAL ELECTRONICS PARTS DISTRIBUTORS

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EDMONTON
Canadian Electronics Ltd., 109 St. at 107 Ave.
Sacker Electronics Co., Ltd., 10235 103rd St.
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VANCOUVER
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Western Agencies Ltd., 951 Seymour St.
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Ellison Queale Radio Supply, 900 View St.

MANITOBA
WINNIPEG
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Del's Electric Motor Supply, 54 Princess St.
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The Crawford Radio, 119 John St. N.
Western Radio Supply Co. Ltd.
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KITCHENER
MacDonald Electric Limited, 307 Queen Street, S.
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OSHAWA
H. W. Gourley Ltd., 311 Viola Avenue
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Wackid Radio Television Laboratories Ltd.
149 Gloucester St.
PORT ARTHUR
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ST. CATHARINES
Niagara Vallance, Brown, 23 Permilla Street
SARNIA
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240 Maxwell Street
TORONTO
Canadian Electrical Supply Co. Ltd., 877 Yonge Street
Electro Sonic Supply Co. Ltd., 543 Yonge St.
Shipman Electronics, 1773 Avenue Road
Wholesale Radio & Electronics Ltd., 66 Orfus Road
WATERLOO
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Designers' book shelf

Creative Engineering Design, by Harold R. Buhl, Department of Mechanical Engineering, Iowa State University. Publisher — Iowa State University Press, Ames, Iowa. 200 pages. Price $3.95.

Here is a new tool for engineers who are seeking ways to improve their creative output. Non technical, conversational presentation is enlightened by excellent sketches, and supported by recommended references and pertinent quotes.

Circle 331 on Reader Service Card

Fluid Power Controls, by John J. Pippenger and Richard M. Koff. Publisher, McGraw-Hill, Toronto. 250 pages. Price $9.00.

A thoroughly practical guidebook on the valves used for fluid-power control applications. It describes their construction and operation, their proper use in the hydraulic circuit, and how to maintain them for best service. Also discussed are pumps, reservoirs, piping, and the development of hydraulic circuits.

Circle 332 on Reader Service Card

Photoelasticity Principles and Methods, by H. T. Jessop and F. C. Harris of University College, London, England. Publisher—Dover Publications, New York. 185 pages. Price $2.00.

Here is an introduction to general and recent developments in two and three dimensional stress analysis techniques. Written for the engineer designer who wishes a physical and practical survey of photoelasticity. Paperbound edition.

Circle 333 on Reader Service Card

Weight-Strength Analysis of Aircraft Structures, by F. R. Shanley, Professor of Engineering, University of California. Publisher—Dover Publications, New York, 405 pages, paperbound. Price $2.45.

The author discusses scientifically sound methods of analyzing and predicting the structural weight of aircraft and missiles. An extremely timely book for the design engineer or stress analyst, this edition contains several new bibliographies and some of the author's original papers on inelastic buckling and creep buckling.

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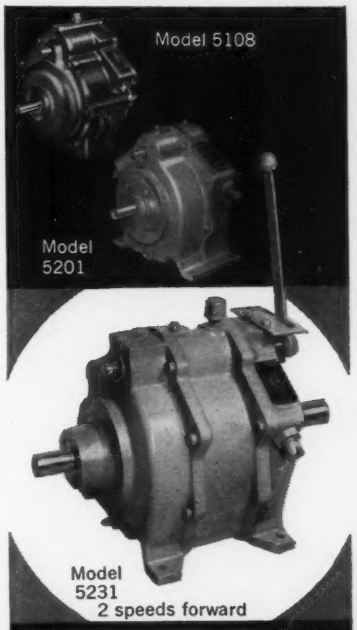
5 models 8 and 28 h.p. with power packed versatility



S-N Reversing Transmissions are performance proven, space-saving single units which reverse under full load. Adaptable to the design or redesign of a wide variety of industrial equipment. For technical data write The Snow-Nabstedt Gear Corp., Hamden, Conn.

SPECIFICATIONS

Model No.		5231	5201	5108
Reduction Forward		1.97:1 3.34:1	3.16:1	3.75:1
Ratio Reverse		3.37:1	3.16:1	3.75:1
Power Up To		28 HP	28 HP	8 HP
Max. Input Torque in. lbs.		1000	1000	320
Max. Input Speed RPM		2400	2400	2400
Dimensions	Long	15 11/16"	11½"	9 1/16"
	Wide	14"	13½"	10"
	High	14¾"	14⅛"	10⅝"

SNOW-NABSTEDT
Industrial Division
Transmission Engineers
For Over Half a Century

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PRE-VALUE ANALYZED
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Hartford's Vers-O-Line is constantly expanding to meet the demand of value analysts for one economical unit to replace several more costly integral parts. Instead of specifying more costly precision bearings explore the possibilities of Vers-O-Line. Hartford engineers can help your design engineers by recommending or adapting a bearing from a wide variety available in stock or can imagineer a new design to meet your product specification that can be produced to effect substantial savings.

Hartford's Vers-O-Line bearings include:

RADIAL... H-Series
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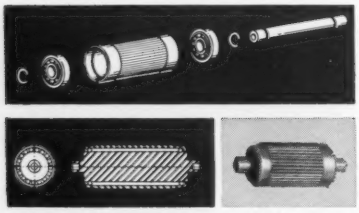
BEFORE—Six separate parts, expensive bearings and costly to assemble.



AFTER—One complete economical assembly, reduced parts, maximum stability.

Write for comprehensive technical literature containing case history applications and helpful bearing ideas.

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HARTFORD STEEL BALL COMPANY
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Briefs

Plastics: Use of **diallyl phthalate** parts in an electronic watch marks entry of plastic in the design of wrist watch movement . . . polypropylene plastic is being used for the **carrying case** of a new portable typewriter; cover and base, as well as hinge area, are molded as a single unit . . . fume hoods for paper mills and other large **corrosion - resistant** components are being made from plastics by Protective Plastics in Toronto . . . laminated plastics are being used for vanes in rotary compressors to endure **uncounted millions** of cycles under stringent conditions . . . a plastic-coated steel pipeline ushers **126,000 gallons** of gasoline daily through a water-soaked and corrosive tract of land in Pennsylvania . . . Du Pont's new Corunna plant has introduced two new lines of high-density **polyethylene** molding resins with melt index of 1.5 and 8.0 . . . urethane foam can be sprayed over an **inflated plastic film** to construct shelters where aesthetic appearance does not count; when foam sets the plastic film is deflated and removed . . .

Gimmicks: After the National Home Show in Toronto last month people were seen wandering the streets with wooden rulers three feet long. They had been given out as a sales gimmick by a Show exhibitor. Not long after, in Chicago, people could be seen on their way home with fearsome-looking mace-like clubs. But the clubs were harmless—just another gimmick. 5,000 of them, made of plastic, had been given out at the National AMA Packaging Exposition to tell the story of blow - molding of polyethylene resin . . .

Aviation: Cornell Aeronautical Laboratory Inc. has developed a camera to study movement of a **pilot's eye** in scanning cockpit instruments to enhance design and arrangement in the cockpit . . . U.S. Army has ordered another 10 **Caribou** STOL transport aircraft, increasing its fleet to 34 . . . British Air Registration Board has increased to 2,600 hours (or one million miles) the overhaul **life** of the Comet's Rolls Royce Avon engines . . . engineers at the recent IRE convention in New York **monitored** flights into New York's metro control area on a repeater indicator at Servo Corp. booth . . .

Visuals: Vocabulary of a new **Russian - English** translator has been increased through use of storage disks

"That stuff about not being able to add on a slide rule is bunk. F'rinstance, to add 3 and 3 you just take the log of 37.2, divide it by the cosine of 19° 47', then . . ."

coated with photographic emulsion replacing magnetic tape or punched cards . . . recent public demonstration in London showed development of X-ray pictures in **15 seconds,** harnessing speed and cheapness of xerography (electrical photography) to X-ray work . . . television camera tube that operates **in the dark** is being manufactured in the U.K.; it could spy on burglars, owls, or bats . . . beefed-up X-ray inspector can **check fill-heights** of 1,000 containers in a minute . . .

Metals: Phosphor bronze replaces aluminium for **frequency rods** in Admiral's TV remote control to effect miniaturization . . . an American foundry using **tin** as a ladel addition considerably reduced hardness variations and produced a material ideal for auto clutch plates where uniform wear and texture are important . . . Fairmount Aluminium has successfully joined aluminium sheet to stainless steel by **molecular bonding** . . . an auto speed control device relies on **zinc** die castings for intricate parts . . . stainless steel castings are giving **seven times** better service life than high chrome cast iron in hot sulphur dioxide gas lines . . .

Legal action: Corporation of Professional Engineers of Quebec has initiated legal action against **two offenders,** claimed to be limited companies usurping the title of 'engineer.' This title is, of course, the exclusive prerogative of the individual engineer in the province of Quebec.

Life on Mars? Man will probably land a device on **Mars** in the next four or five years and determine what kind of life exists there, but he is unlikely to

(Continued on page 72)

CF-104 PRECISION CONTRACTS TO JARRY HYDRAULICS

Because of a substantial reputation for the ability to produce highly sophisticated equipment, Jarry Hydraulics Limited has been awarded contracts for the Canadair-built CF-104 which will take full advantage of the Company's precision manufacturing skills. These call for Jarry to supply:

The 10 gpm aircraft hydraulic pumps, under licence from the Kellogg Division of American Brake Shoe Co.

Electro-servo valves under licence from Cadillac Gage Co.

Powered flight controls under licence from Bertea Corporation.

In addition to the above, Jarry is manufacturing the main landing gear.

If you have requirements in hydraulics, hydraulic systems or in any area calling for imaginative engineering and precise manufacturing talk to Jarry.

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Briefs — *continued*

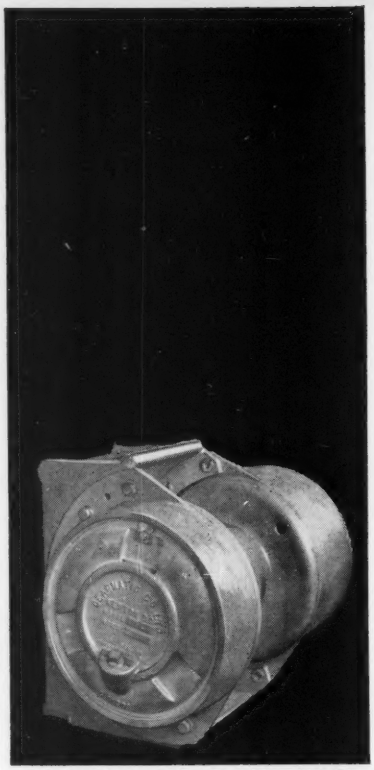
find a race of creatures similar to human beings. This is the thinking of Philip Morrison, professor of physics at Cornell University. He says that, based on evidence gathered by peering through the giant telescopes it is pretty certain no highly developed life exists in our solar system. But there could be in other parts of the **universe.** Prof Morrison believes there are no canals on Mars, no cities on her moons, but probably plant life on the planet.

Diesels: The **largest diesel** engine ever exhibited at Olympia, London, England, is one of ten ordered for a power station in Ghana; it weighs 96 tons . . . there is a recent report that diesels are being used more than ever in light and medium trucks as a result of further **reductions** in weight and size; it's claimed newer diesels deliver greater economy in these applications . . .

Deutsche news: Preliminary **design** of an organic moderated and cooled reactor for a 150,000 kilowatt nuclear plant will be conducted by Atomics International for a power plant planning association in Germany . . . a new company, Deutsche Controls GmbH, has been organized in **Duisburg,** Germany as sales and service headquarters for Controls Company of America . . .

Bits and pieces: The Committee of Steel Pipe Producers has come up with a most interesting booklet on the modern **skating** rink (artificial of course) . . . **"hazard hunters"** is the name given the safety committee at C-I-L's Paint Research Lab, Toronto—surprise inspection is the prime technique . . . we like the **cartoon posters** IAPA sends out each month; make sure your company is on the mailing list . . . design work has begun on yet another **nuclear power reactor;** this time Atomics International is trying an organic type . . . over **300 million** phonograph records are being produced in the U. S. each year; we tried to calculate the total distance a needle would have to travel in playing all of these, but there seems to be something of a catch to the question . . . Westinghouse claims to have a new **shade of white** for its fluorescent lamps —isn't white, white? . . .

Talepiece: A recession is when you tighten your belt. A depression is when you have no belt to tighten. And when you have no pants to hold up economists had better start thinking up a new phrase. ★



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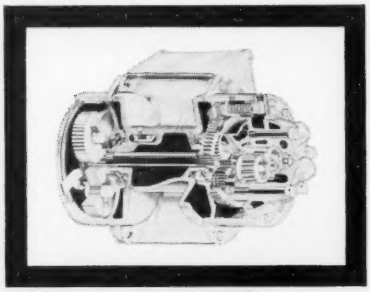

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New standards

The following new standards have recently been published. They are available through the Canadian Standards Association, 235 Montreal Road, Ottawa 2, Ontario.

B150.1-1961—Domestic gas ranges (free standing units)

This is the first edition of a series of standards covering minimum requirements for safe operation, design, construction, manufacture, marking and testing of gas burning appliances and equipment. It applies to domestic gas ranges (free standing units) for use with natural manufactured and mixed gases; for use with liquefied petroleum gases or LP gas-air mixtures. It also applies to domestic gas ranges (free standing units) which incorporate a gas-fired room heater.

Price $3.50

B150.2-1961—Domestic gas ranges (built-in cooking units)

This is the first edition in a series covering minimum safety requirements and acceptable performance of gas burning appliances and equipment. Minimum requirements of design, construction, manufacture, marking and testing are covered. It applies to domestic gas ranges designed to be recessed into, placed upon, or attached to counters, cabinets, walls or partitions.

Price $3.50

C22.2 No. 122-1961 — Hand-held electrically heated tools

This is the first edition of No. 122 in a series issued under the Canadian Electrical Code. Part II applies to portable, hand-held, electrically heated tools for potentials of 250 volts and less, designed for use in ordinary (non-hazardous) locations in domestic, commercial or industrial applications; and to soldering irons of both the resistance and transformer type, including those with solder-pot tips, sealing and tacking irons, paint-scraping tools, wood-burning tools, pants pressers, tire regroovers, and similar tools.

Price $1.50

S 16-1961—Steel structures

This fifth edition applies to design, fabrication and erection of structural steelwork for buildings and contains an additional section on plastic design.

Price $1.25

Z87-1960 — Horizontal Underground Storage Tanks for Petroleum Products

This new CSA Standard applies to horizontal underground tanks of the cylindrical non-pressure type, for the storage of flammable liquids. It covers tanks from 500 to 5,000 gallons.

Price 75 cents

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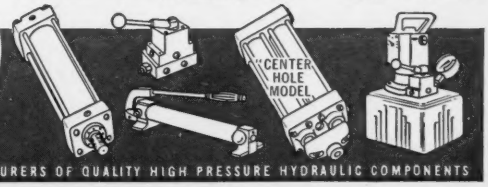

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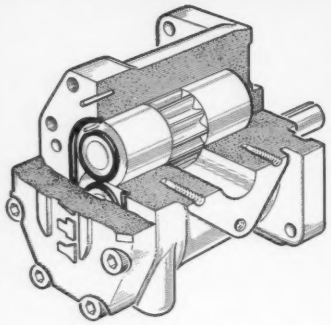

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People . . . . . and events

Quebec engineers' new president

A. J. Groleau, right, new president of the Corporation of Professional Engineers of Quebec with the Prime Minister and retiring president Arthur Piche.

A. J. Groleau, P.Eng., vice-president and general manager of the Bell Telephone Company of Canada has been elected president of the Corporation of Professional Engineers of Quebec for 1961-62. He succeeds Arthur Piche, P.Eng. of Quebec City.

Transfer of office took place at the annual meeting in Montreal last month where Prime Minister John Diefenbaker was presented with a certificate of honorary membership.

Quebec City consulting engineer, Gilles Sarault is the new vice-president while H. J. Racey, a Montreal consulting engineer has been re-elected honorary secretary-treasurer. A new member elected to council is R. A. Phillips, manager of marketing for Canadian General Electric.

New nickel plant

Commercial production of refined nickel has now begun at the free world's second largest nickel plant operated by The International Nickel Company of Canada Limited at Thompson in northern Manitoba.

A ribbon cutting ceremony marked the start of operations only 51 months after plans for the $185 million project were announced. The world's first fully integrated nickel mining and processing plant, it will step up the company's production capacity by 75 million pounds to 385 million pounds.

The new town of Thompson, developed to accommodate the present 1,800 employees now has a population of almost 4,500. Provision has been made for population expansion to 8,000. Doctor John F. Thompson, for whom the town and plant are named, was at the opening ceremony. He is a retired Chairman of the company.

Ontario trade talks

First in a series of federal-provincial trade and industrial promotion conferences will be held in London, Ontario on May 25.

All businessmen and manufacturers in southwest Ontario have been invited to attend the one-day talks organized by the Ontario and Canadian Chambers of Commerce. Minister for Trade and Commerce, George Hees and Ontario's Commerce and Development Minister W. M. Nickle will also take part.

Further conferences are being organized for other Ontario areas.

See P.Eng. jobs expand

The demand for engineers and scientists will continue for the next few years, though at a lower rate of expansion than the peak years 1955-1957. Employers will place greater stress than before on the quality of recruits.

These views were voiced by the advisory committee on professional manpower, convened recently by the Department of Labor. The committee, which was holding its sixth meeting, said the highest rates of employment expansion might be in metallurgical, mechanical, civil and chemical engineering in the next two years. It expected

a levelling off in electrical engineering and slower gains in mining engineering.

The main source of recruitment would be Canadian university graduates. Immigrant engineers will remain scarce and cannot be expected to increase in the foreseeable future.

New Canadian company

Canadian Aviation Electronics Ltd. of Montreal, Ferranti-Packard Electric Ltd., Toronto and The De Haviland Aircraft of Canada Ltd., Toronto have formed a jointly owned subsidiary to be named DCF Systems Ltd.

The new company will undertake management, design, development and manufacture relating to commercial and military equipment programs in the fields where the parent companies are complementary. First project is provision of management assistance and technical support at the North Bay Bomarc base in conjunction with Boeing Aircraft.

Research scholarships

The National Research Council of Canada has granted 588 scholarships for 1961-62 with a total value of $1,270,000.

Five hundred and twenty-two are for graduate work at Canadian universities. These include 186 bursaries worth $1,800 each and 336 studentships worth $2,200 each.

Awards for study abroad include 38 special scholarships, worth $2,000 each. Thirty-three of these are to be held in the United Kingdom, four in the United States and one in Belgium.

Licensing agreements

The following licensing agreements have been signed by Canadian companies:

Dominion Bridge Company Ltd. is to manufacture a wide range of steam generating units designed by John Thompson of England Ltd.

Canefco Ltd. Scarborough will manufacture and sell a new fluidized bed industrial furnace developed by Boeing Airplane Company.

Sperry Gyroscope Ottawa Ltd. will manufacture and market all products of Industrial Timer Corporation of Newark, New Jersey.

Marsland Engineering Limited, Kitchener has acquired sales and manufacturing licences for the entire line of military electronic products of the John Oster Manufacturing Co., Avionic Division, Racine, Wis.

Honors

1961 award of the American Society of Photogrammetry went to Gilbert L. Hobrough of Toronto for his contribution to the development of an automatic stereo plotting system.

Professor James Urquhart MacEwan, soon to retire as head of McGill's metallurgical engineering department has won The International Nickel Company's platinum medal for his contribution to Canada's mining industry.

Theo Dimson, a member of Art Associates Limited Toronto designing team goes to Japan this summer to study graphic arts and design under a Canada Council senior fellowship.

Firm's centenary

The one-hundredth anniversary of the development of a tinsmith's shop into a Canada-wide metal products manufacturer is now being celebrated by The Pedlar People Limited, Oshawa. Since 1861 the tinsmith's bench has grown into a plant covering a quarter of a million square feet in Oshawa with branch premises in eight other cities from Montreal to Vancouver.

Founder, Englishman Henry Pedlar settled in Skea's Corner (now Oshawa) in 1841 and begun selling kitchen necessities. He was later joined by his son George who helped initiate the move into manufacturing.

(Continued on page 76)

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Superbly made and completely dependable, Cooper Split Roller Bearings are first choice for continuous plant process equipment and other machinery in thousands of plants all over the world.

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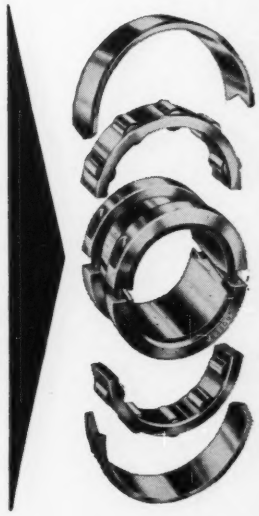

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People . . .
. . . and events

(Continued)

Appointments

Hugh D. McMillan has been appointed road design engineer with the Department of Highways, Ontario.

Norman Rudnick, who graduated in engineering physics at McGill has been appointed director of the new transducers and material laboratory of Gulton Industries, New Jersey.

W. H. Woods has been appointed manager, industrial division, for The Robbins & Myers Co. of Canada Ltd.

A. Vilcini has been promoted vice-president and assistant general manager of Controls Company Canada Ltd.

J. M. Bridgman has been appointed vice-president and general manager of Litton Systems (Canada) Ltd.

Zygmunt Karwowski has been appointed director of engineering of Kee Klamps North America Ltd.

R. S. Edwards has been elected president Edwards of Canada Ltd. He continues as board chairman. Vice-president G. P. Nelson has been elected managing director.

T. A. Bedford has been elected president and director of Henry J. Kaiser Company (Canada) Ltd.

Woods

Karwowski

J. H. Waghorne, P.Eng., of Toronto has been appointed chairman of the certification board for engineering technicians and technologists in Ontario.

For your calendar

May 8-9: Symposium on Titrimetric Methods, Cornwall, Ontario.

May 8-10: National Power Instrumentation Symposium, Instrument Society of America, La Salle Hotel, Chicago.

May 8-10: Spring Lubrication Symposium, American Society of Mechanical Engineers, Deauville Hotel, Miami Beach, Florida.

May 8-12: National Industrial Production Show, Industrial and Coliseum Buildings, Toronto.

May 11-13: American Institute of Industrial Engineers, national convention, Sheraton-Cadillac Hotel, Detroit.

May 12-13: Canadian Institute of Steel Construction Inc., annual meeting, Seigniory Club, Montebello, Quebec.

May 17-19: Society for Non-destructive Testing, regional convention, Mount Royal Hotel, Montreal.

May 18: Canadian Standards' Association, annual meeting, Queen Elizabeth Hotel, Montreal.

May 19-20: American Institute for Design and Drafting, seminar, Oklahoma State University.

May 22-25: Design Engineering Show, Cobo Hall, Detroit.

May 30-June 2: Engineering Institute of Canada, annual meeting, Vancouver.

June 5-8: International Instrument-Automation Conference and Exhibit, Instrument Society of America, Queen Elizabeth Hall, Toronto.

June 5-9: Plastics Exposition, Coliseum, New York.

June 15-24: International Construction Equipment Exhibition, Crystal Palace, London.

June 25-30: American Society for Testing Materials, annual meetings, Chalfonte-Haddon Hall, Atlantic City.

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21 ways reinforced plastics improve existing products... ...make new products possible

1. Highest strength/weight ratio
2. High Modulus of Elasticity
3. High dielectric factor
4. Lighter than aluminum
5. Only slightly heavier than hardwood
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13. Permanent—does not weaken, craze, or discolor with age
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16. Excellent non-magnetic properties
17. Excellent acoustic properties
18. Up to 70% less tooling cost for moldings—50% less tooling time
19. Runs as low as 500 moldings practicable
20. Easily machinable with correct tools
21. Easily repairable if damaged

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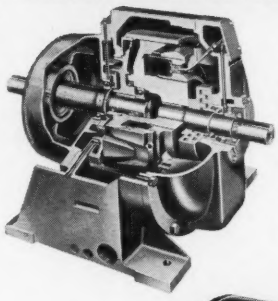
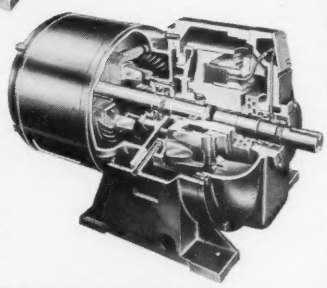
Liquid-Cooled, Eddy-Current

COUPLINGS AND DRIVES



Dynamatic Liquid-Cooled Couplings provide infinitely adjustable speeds for nearly every application from 3 to 75 HP. Heavy-duty types with capacities up to 5,000 HP are also available.

"Dynaspede" Drives are Dynamatic Liquid-Cooled, Stationary-Field Eddy-Current Couplings mounted integrally with standard, D-flange, squirrel cage motors. Available in capacities from 3 to 75 HP.



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Principle of Operation: Rotary power is transmitted through the coupling by an electro-magnetic reaction between the driving and driven members. Varying the excitation to the field coils changes the magnetic field strength, which in turn proportionately affects the torque developed.

OUTSTANDING FEATURES:

- Operates on A.C. supply
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- Compact design
- Completely enclosed

A wide range of control features may be obtained from a remotely-mounted electronic control system . . . infinite speed adjustment, contact speed control, on-off clutch control, torque limit, acceleration control, inching and threading and many others.

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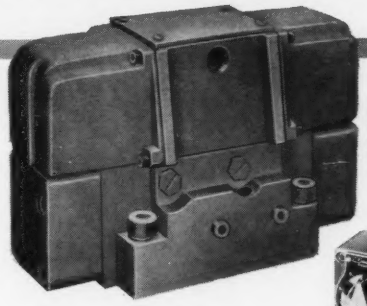

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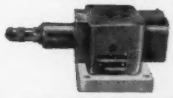

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MANUALLY OPERATED VALVES

Choose your valve requirements from TEM's ample stocks of famous Double A hydraulic control valves. Double A valves offer the widest selection of types and sizes—Permit you to make custom built circuits without added costs of custom priced valves. Double A valves are a product of Brown & Sharpe—Write for our complete catalogue.

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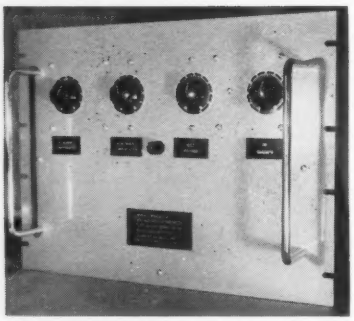
New products and materials

Calculators

Just made available to the Canadian and U.S. markets is a range of British calculators for the rapid fixing of complete machining times for the most general types of machining operations. Each calculator is in the form of a special-purpose circular slide rule, providing complete production times for machining operations. One section determines cutting time and provision is made for users who want to include speeds and feeds based on their own experience. Other sections determine loading and manipulation times, taking into account all the usual allowances according to size of work, weight, type of operation, accuracy, etc. **Fearns, Mear & Co.**

Circle 335 on Reader Service Card

Voltage relay



A new static sensitive voltage relay to operate step or induction type regulators. The unit employs solid state components and saturable cores, thus eliminating moving parts or contacts. Mounted on a standard 19 in. relay rack panel, with front mounted control knobs. **Bepco Canada Ltd.**

Circle 336 on Reader Service Card

Sub-miniature differentials

A new line of sub-miniature precision differentials for highly critical applications in computer assemblies and control instruments. The two-spider gear design features a ½ inch diameter swing which permits extreme miniaturization. Made entirely of stainless. **Instru-Lec Corporation.**

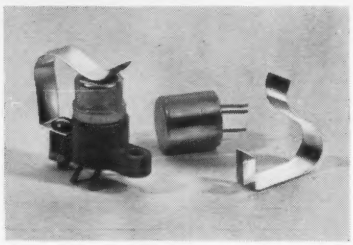
Circle 337 on Reader Service Card

Bar rack

An inexpensive light duty bar rack is produced by all-welded upright "A" frames with 12 in. long sloped arms welded in position. The "A" frames can be built to any desired size and any number may be attached at any desired spacing to provide support for all types of bars, tubes, rods, etc. **Service Steel & Engineering Ltd.**

Circle 338 on Reader Service Card

Transistor clips



Two new retaining clips for socket mounted transistors comply with military requirements for retention of plug-in devices. They provide a positive spring pressure retention on the transistor case top for easy access, and can be used in applications requiring heat removal. **Birtcher Corp.**

Circle 339 on Reader Service Card

Servomechanism control

A servomechanism control that can be applied to existing induction motors provides reliability with only one moving part. Automation of large valves and the largest mechanical adjustable speed motors can be accomplished. Positioning better than 0.5% is a feature. **Electromation Company.**

Circle 340 on Reader Service Card

Isolation pad

Specially processed, high density fiberglass is used in a new vibration isolation pad used to isolate vibration and eliminate lagging machinery to the floor. No cementing, sawing, floor drilling or waiting is required. The pads are supplied in sheets 18 in. square and ½ in. thick which are pre-scored at 2 in. intervals for fast cutting to size on the job-site with a pen-knife. For efficient workflow it permits mobile production machinery. **Consolidated Kinetics Corp.**

Circle 341 on Reader Service Card

High pressure control

A new high pressure control with an adjustable operating range of 500 to 5,000 psig, has been introduced. It has maximum momentary surge of 7,000 psig. **Davis Automatic Controls Limited.**

Circle 342 on Reader Service Card

Gaugeless regulators

A new line of multi-stage gaugeless regulators for oxygen, acetylene and propane that virtually eliminate hazards of improper operating procedures, has been introduced to Canada. They feature a one-inch metallic non-inflammable diaphragm in the safety stage and have first- and second-stage safety valves. **British Oxygen Canada Ltd.**

Circle 343 on Reader Service Card

Overload relay

A new ambient compensating overload relay that provides accurate motor protection where wide fluctuations of temperature are encountered. A parallel system of bimetals provides the ambient temperature compensation. **Arrow-Hart & Hegeman (Canada) Limited.**

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Gear-head motors

A new line of planetary drive gear-head motors powered entirely by hydraulics features a metering valve which operates in both rotations and provides exceptionally smooth stops and starts. The new in-line units are available in three sizes and six reduction ratios and can be supplied with the same speed in both rotations or with a high-speed reverse which produces 0-5¼ times forward speed. **Gearmatic Co. Ltd.**

Circle 345 on Reader Service Card

Adhesive film

Du Pont's new PCF film Teslar is now available in self-adhesive form for bonding to a wide range of materials to provide a long-wearing weatherproof surface. The self-adhesive Teslar can be made available in transparent and metallized form, as well as in pigmented colors. Teslar itself has exceptional weatherability, toughness and chemical resistance. **Fasson Products.**

Circle 346 on Reader Service Card

Trigger tube

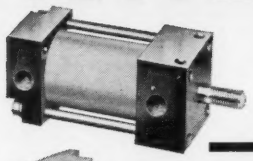
A sub-miniature gas-filled, cold cathode trigger tube has been designed for use as an inertialess switch and counter in automatic telephone exchanges and for timers. Unlike relays, the tube needs no maintenance and gives very high speeds in making connections. **Rogers Electronic Tubes & Components.**

Circle 347 on Reader Service Card

"Here's the sample casting you requested — hot off the mold!"

NEW

COMPLETE LINE INTERCHANGEABLE VICEROY AIR & HYDRAULIC CYLINDERS



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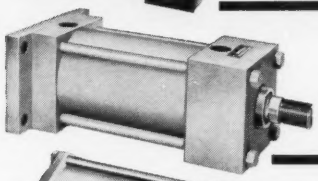

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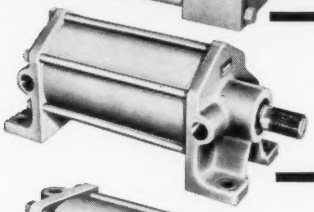

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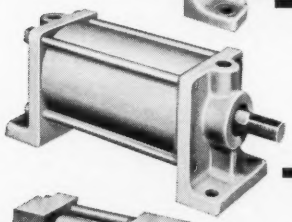

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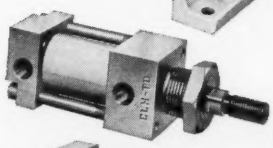

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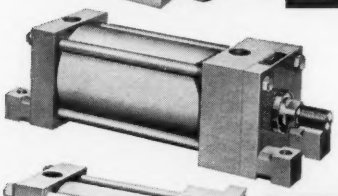

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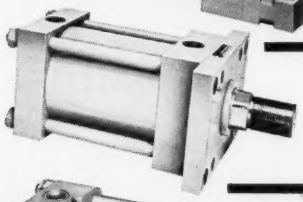

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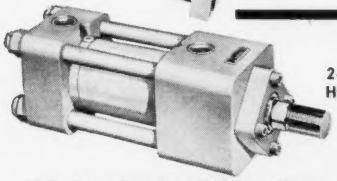

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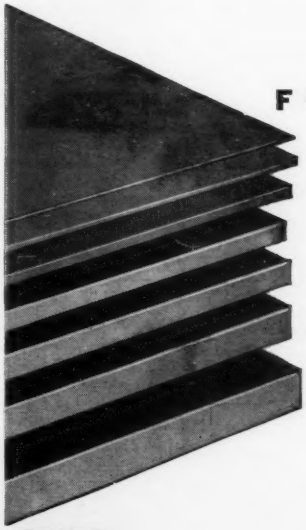

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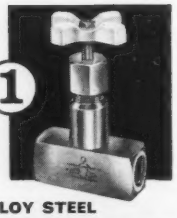

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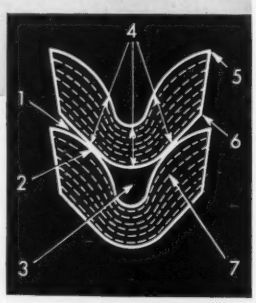

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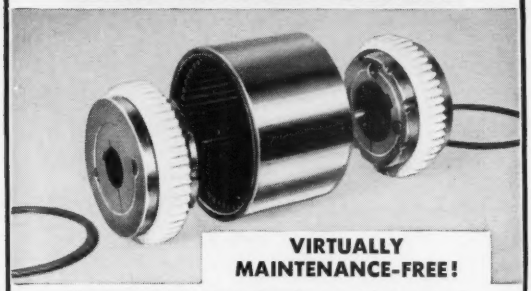

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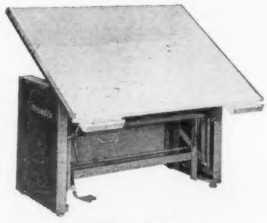

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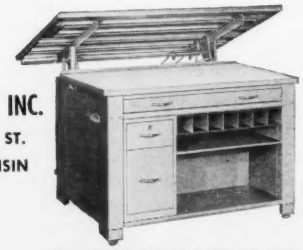

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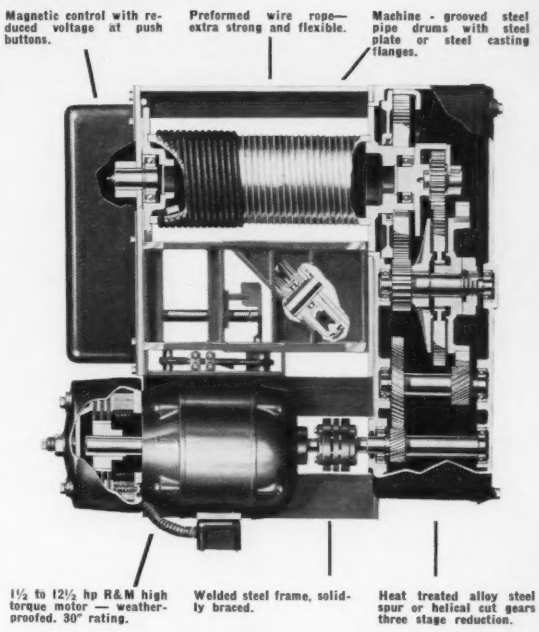
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Technical literature

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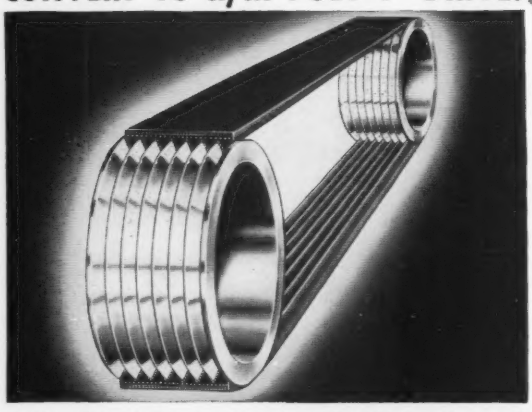

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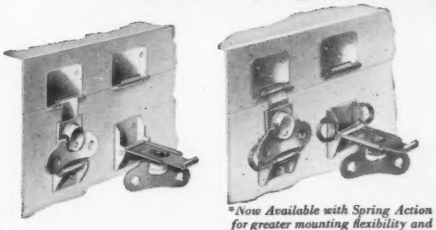

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backlash

N.I.P.S. is growing

The National Industrial Production Show in Toronto is fast becoming one of Canada's biggest and most important events on the engineering calendar. Not only does NIPS provide an authoritative display of the very latest in machinery and equipment from the major countries around the world, but it attracts thousands of the nation's top executives and technologists.

The fact that the American Society of Mechanical Engineers has chosen to hold this year's conference of its Production Engineering Division in conjunction with the Show, is evidence of the growing significance of NIPS. It will be the first time the Production Engineering Conference has been held in Canada since ASME was formed forty years ago.

At Toronto's last National Industrial Production Show in 1959, sixteen thousand people saw the exhibits. This year that figure should be swelled with the inflow of American conferees that will give NIPS the added international prestige it so well deserves.

Those who attend will see 400 exhibits covering a quarter of a million square feet of the Industrial and Coliseum buildings at Toronto's Exhibition Park. Apart from the usual display of equipment for boosting plant productivity there will be a special section on welding, and exhibits covering drafting supplies, industrial heating, lubricating systems, and ultrasonic, plastics and process equipment. The United Kingdom has taken space for a special exhibit illustrating British engineering projects with examples of production engineering innovations.

An impressive program of seminars and technical society meetings will be held during the period of the Show. Canadian Industrial Management Association plans a Mechanization seminar on May 8, and Canadian Welding Society is holding its convention May 9 and 10. With ASME's Engineering Production Show May 9-12, the big week will bring several leading world authorities to Canada. Engineers from the United Kingdom, the Continent and Japan are slated to present papers at the various meetings along with the top practitioners and educators from Canada and the United States. It can be certain visitors of this calibre will not depart without learning something of Canada's burgeoning industrial scene.

What about design?

An encouraging move has been made to stimulate manufacturing in Ontario by the Industrial Development Branch of the provincial Department of Commerce and Development. A new Products Research Division has wet its feet with a campaign to encourage U. S. manufacturers to establish licensing agreements for their products with Canadian companies.

With a direct mailing to 18,000 industrial concerns across the States, the Division aims to hit top decision-making executives and follow up with planned advertising through newspapers and the periodical press. And if the mailing proves successful a similar campaign will be drawn up for other foreign countries.

Realizing that many U. S. companies are unwilling to establish Canadian branch plants because of the large capital outlay, the campaign is designed to show that a manufacturing arrangement will be a rewarding way of capturing a greater share of the Canadian market. Elimination of customs duties and transportation costs will help reduce the price of the products, and better still, for Canadians, create more job opportunities. So far 500 Ontario companies have indicated their interest in negotiating for licensing agreements.

The campaign is certainly a step in the right direction, but perhaps it does not cover quite as much ground as is desired. No doubt, it should encourage production in Canada of goods that now have to be imported; but a little longer and wiser step would be to encourage design of alternative products in Canada, as well.

Spotlight on technicians

During the week beginning May 29, the spotlight will be directed on to Ontario's 1,500 engineering technicians and technologists. It will be Commonwealth Technical Training Week in Canada. Aim of the event is to focus public attention on the field of technical training below university level, including trades training and the training of engineering technicians and technologists.

Many professional engineers are at last coming to realize the important role that can be played by such people in coping with many of the non-professional duties of the engineer, thus releasing them for full-time professional work.

Yet so far, Ontario is the only province to have a certification program for technicians and technologists. Established in 1957 under the guidance of the 20,000 member Association of Professional Engineers of Ontario, it provides a means of grading technically trained persons according to qualifications and experience.

But the matter, in Ontario, is also one of increasing importance, as technicians and technologists are fast moving toward formation of a self-governing organization. The newly appointed chairman of the Ontario certification board, J. H. Waghorne, P.Eng., said a major task of the board this year would be to help find and train leaders for the new organization.

Fourth annual meeting for technicians and technologists will be held at the King Edward Hotel, Toronto, on May 27.

Summer help

"No doubt there are many projects on your "to-do" list which are being put off because you haven't the time or staff to tackle them now." So editorializes the southern Ontario chapter of American Institute of Industrial Engineers in a recent newsletter.

What the author is really getting at, is a straightforward and useful hint that industrial engineers consider employing a university student during the summer vacation to help prune down the "to-do" lists. He says there are industrial engineering undergraduates and other students who have done courses in business administration who could bring to a problem an analytical approach and a keen interest in production and management affairs.

This is an area worth considering. The old approach has been that it takes so long to train students for useful work that they are not worth hiring for a relatively short summer season. Up till now most have had to spend their summers piling cartons in a warehouse. With some thought, perhaps you'll find there's a chore some student can help you with this year.

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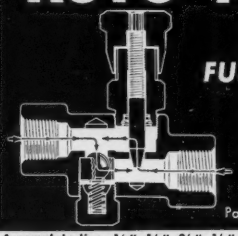

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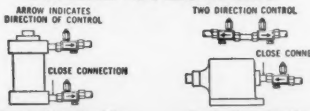

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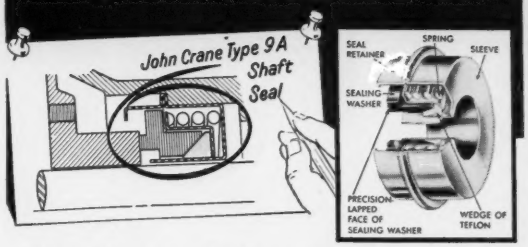

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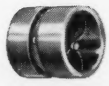

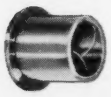

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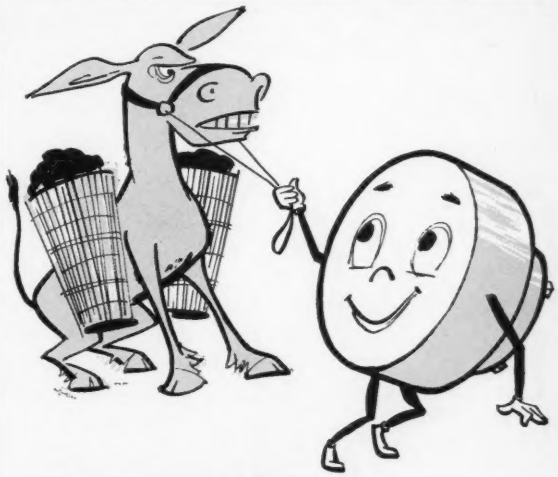

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Editorial

The Design Engineering Show claims our attention

. . . and we still don't like what Canada is doing

Once again it is Design Engineering Show-time . . . and once again this publication feels privileged to be able to present a preview (see page 51) of that important event.

Because the Show is being held this year in Detroit, in the magnificent new Cobo Hall, Canadians are taking almost as much interest as if it were being held within their own borders.

To the engineer who wants to know more about the latest in materials and components . . . to the executive looking for the new trends in design . . . to the draftsman anxious to keep abreast of the techniques of his trade . . . to all these we commend the Design Engineering Show. We can assure you that you will not be disappointed.

However, as an editor, speaking for Canadian engineers and industry, we are greatly disappointed in a number of elements related to the Design Show. And we would feel remiss in our duty if we did not take this opportunity to mention them.

Although the Show and associated ASME Design Conference are being held in Detroit this year, partly in an effort to encourage Canadian engineers to attend, **not one single Canadian engineer has been invited to participate as a guest speaker in the technical paper program.** By contrast, the joint EIC-ASME 1961 Hydraulics Conference being held two weeks earlier in Montreal will have no less than 19 of the papers delivered by U. S. engineers, while only 15 of the speakers will hail from Canada.

We would like to suggest to the ASME Design Conference organizers of the future that they might do well to look to Canadian engineers to provide at least one of the technical sessions.

Our other disappointments relate to the Canadian participation in the Show (see page 56). It seems that every time we get involved with the Design Show, we find something to complain about in the Department of Trade's handling of the Canadian exhibit. And this year is no exception.

The sole objective of the Design Show is to present to the design engineer and other industrial executives the latest information on engineering materials, components and techniques. It is not a forum for the display of engineering prowess or grandiose products which the Canadian government is anxious to sell to foreign governments. In fact, it is no place to be showing consumer or end-type products at all.

For this reason we seriously question the advisability of the proposed Canadair display (see page 59) . . . we wonder how many design engineers will be specifying one of these, or similar craft, under one of their projects for the coming year? Better Canadair should show some of their industrial products . . . even if they aren't so spectacular.

We also suspect that there was an error in the selection of some of the other products to be on display. There is no need for duplication or even similarity of products exhibited by different companies . . . yet this appears to be the plan. Again, there is no justifiable reason for permitting any company to have the same products on display two years in a row . . . the surest way to discourage interest in the Canadian exhibit is to present the same old stuff year after year. In at least two cases, Canadians will have the identical product which they exhibited last year.

In spite of these defects in the Canadian program, we expect this year's show to be the biggest and best yet. We are planning to attend . . . how about you?

Doug Kaill

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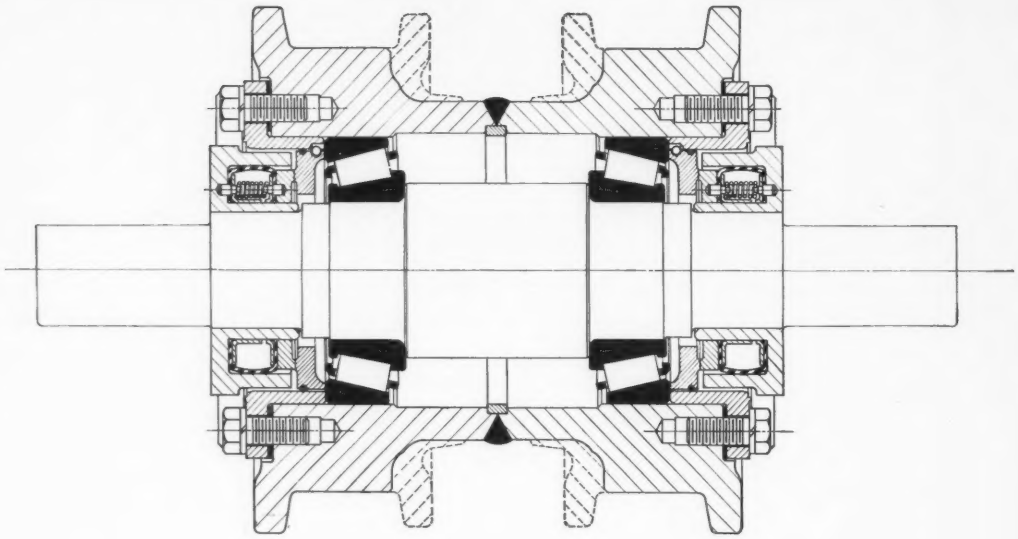

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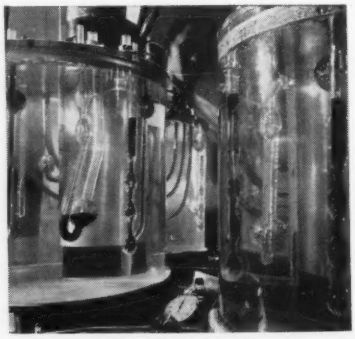

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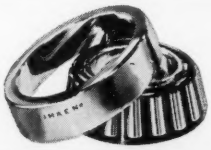

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